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ECONOMIC SCIENCE FOR RURAL DEVELOPMENT

Proceedings of the International Scientific Conference

FINANCES, TAXES, INVESTMENT AND SUPPORT SYSTEMS

№ 20

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Proceedings of the
International Scientific Conference

FINANCES, TAXES, INVESTMENT AND SUPPORT SYSTEMS

№ 20
Jelgava
2009

TIME SCHEDULE OF THE CONFERENCE:

Preparation – September, 2008 – April 20, 2009
Process – April 23-24, 2009

- Latvia University of Agriculture, 2009
- West University of Timisoara, 2009
- Aristotle University of Thessaloniki, 2009
- Technological Educational Institute of Thessaloniki, 2009
- Georgian Subtropical Agricultural State University, 2009
- Batumi Shota Rustaveli State University, 2009
- University of Helsinki, 2009
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- Agricultural University of Szczecin, 2009
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- Higher School of Economics and Culture, 2009
- Institute of Economics of Latvian Academy of Sciences, 2009
- School of Business Administration "Turība", 2009
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All reviewers were anonymous for the authors of the articles.

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Priekšvārds

Latvijas Lauksaimniecības universitātes (LLU) Ekonomikas fakultātē līdz ar ikgadējo, tradicionālo starptautisko zinātnisko konferenci „Ekonomikas zinātne lauku attīstībai" iznāk tajā prezentējamo pētījumu starptautiski recenzētie zinātnieki raksti. **Šogad konference tiek organizēta 10.reizi par godu Ekonomikas fakultātes 40.gadu jubilejai.** Tajā piedalās liels skaits ekonomikas zinātnieku no daudzām Eiropas valstīm. Konference ir veltīta aktuālai lauku attīstības tematikai, tādēļ ir izdoti trīs secīgi laidieni (Nr.18., 19. un 20.). Šādu zinātnisko rakstu pirmais laidiens iznāca 2000.gadā.

2009.gada 23. un 24.aprīļa starptautiskajā zinātniskajā konferencē piedalās un savus zinātniskos pētījumu rezultātus prezentē profesori, zinātņu doktori, asociētie profesori, docētāji, doktoranti un citi pētnieki no šādām augstskolām un zinātniski pētnieciskajām iestādēm:

- Latvijas Lauksaimniecības universitāte
- Timisoara Rietumu Universitāte
- Saloniku Aristoteļa universitāte
- Saloniku tehnoloģiju institūts
- Gruzijas Subtropiskās lauksaimniecības valsts universitāte
- Batumi Shota Rustaveli valsts universitāte
- Helsinku Universitāte
- Somijas meža pētnieciskais institūts
- Zviedrijas Lauksaimniecības zinātņu universitāte
- Latvijas Universitāte
- Daugavpils Universitāte
- Tartu Universitāte
- Igaunijas Dzīvības zinātņu universitāte
- Šauļu Universitāte
- Lietuvas agrārās ekonomikas institūts
- Varšavas Dzīvības zinātņu universitāte
- Poznaņas Ekonomikas universitāte
- Ščecinas Lauksaimniecības universitāte
- Kujawy and Pomorze Bydgoszcz universitāte
- Zielona Góra universitāte
- Fuldas Profesionālā universitāte
- Rēzeknes augstskola
- LLU Lauksaimniecības tehnikas zinātniskais institūts

Foreword

Every year the Faculty of Economics, Latvia University of Agriculture holds the international scientific conference "Economic Science for Rural Development" and publishes internationally reviewed papers of scientific researches, which are presented at the conference. This year the 10th annual international scientific conference is dedicated to the 40th anniversary of the Faculty of Economics, Latvia University of Agriculture.

Many economic scientists from different European countries participate in the conference. The themes of the conference are very closely connected with the current situation, therefore three volumes of the conference proceedings are published – 18, 19 and 20. The first volumes of scientific conference proceedings were published already in 2000.

This year the international scientific conference on April 23-24 is organised by the Department of Business and Management of the Faculty of Economics, Latvia University of Agriculture. The number of participating universities and scientific institutes increases with every year. Professors, associate professors, assistant professors, PhD students, and other researchers from the following higher education institutions participate in the conference and present their results of scientific researches:

- Latvia University of Agriculture
- West University of Timisoara
- Aristotle University of Thessaloniki
- Technological Educational Institute of Thessaloniki
- Georgian Subtropical Agricultural State University
- Batumi Shota Rustaveli State University
- University of Helsinki
- Finnish Forest Research Institute
- Swedish University of Agricultural Science
- University of Latvia
- Daugavpils University
- University of Tartu
- Estonian University of Life Sciences
- Siauliai University
- Lithuanian Institute of Agricultural Economics
- Warsaw University of Life Sciences
- Poznan University of Economics

- Patras Universitāte
- Missouri-Columbia Universitāte
- Banku augstskola
- Kubanas valsts universitāte
- Kurganas Valsts lauksaimniecības akadēmija
- Ekonomikas un Kultūras augstskola
- Latvijas Zinātņu Akadēmijas Ekonomikas institūts
- Biznesa augstskola „Turība"
- Debrecenas Universitāte
- Udines Universitāte

Konferencei izvēlēti 10 aktuāli temati:

- Ražošanas efektivitāte lauksaimniecības primārajā un sekundārajā sfērā
- Lauku attīstība un globalizācija
- Lauku ekonomiskā un sociālā attīstība
- Finansiālā atbalsta efektivitāte
- Reģionālā lauksaimniecība specializācijas un globalizācijas kontekstos
- Kooperācija un integrācija
- Lauku mentalitāte un kultūras attīstība laukos
- Informācijas loma lauku attīstībā
- Lauku attīstības menedžments
- Dzīves un vides kvalitāte laukos
- Patēriņa izmaiņas lauku attīstībā

Šie temati ietilpst trīs zinātnisko rakstu laidienos.

Starptautiskās zinātniskās konferences zinātniskuma un starptautiskiem standartiem atbilstošu zinātnisko darbu prezentēšanas nodrošināšanai veikta vispusīga iesniegto zinātnisko rakstu starptautiska un starpaugstskolu recenzēšana. Šajā nolūkā lielākā daļa zinātnisko rakstu ir angļu valodā.

Katru iesniegto zinātniskā raksta manuskriptu vērtēja (recenzēja) parasti viens autora valsts recenzents un otrs – citas valsts vai citas augstskolas recenzents. Pretrunīgu recenziju gadījumā darbs tika nodots vēl trešajam recenzentam. Recenzenti darbu autoriem bija anonīmi.

Katram autoram tika nosūtīti recenzentu iebildumi vai ieteikumi. Pēc uzlabotā (galīgā) varianta un autora paskaidrojuma saņemšanas katru zinātnisko rakstu vērtēja šīs konferences zinātnisko rakstu redkolēģija.

- Agricultural University of Szczecin
- Kujawy and Pomorze University in Bydgoszcz
- University of Zielona Góra
- Fulda University of Applied Sciences
- Rēzekne Higher School
- Research Institute of Agriculture Machinery of Latvia University of Agriculture
- University of Patras
- University of Missouri-Columbia
- BA School of Business and Finance
- Kuban State University
- Kurgan State Agricultural Academy
- Higher School of Economics and Culture
- Institute of Economics of Latvian Academy of Sciences
- School of Business Administration "Turība"
- University of Debrecen
- University of Udine

All the proceedings are arranged according to 10 thematic units:

- Efficiency of production in primary and secondary sectors of agriculture
- Rural development and globalisation
- Rural social and economic development
- Efficiency of financial support
- Regional agriculture within the context of specialisation and globalisation
- Co-operation and integration
- Rural mentality and cultural development in rural areas
- Role of information in rural development
- Rural development management
- Quality of life and environment in rural areas
- Consumption changes in rural development

These themes are arranged in three volumes.

The comprehensive reviewing of submitted scientific articles has been performed on international and inter-university level to ensure that only high-level scientific and methodological research results, meeting the requirements of international standards, are presented at the conference. The majority of articles are in English.

Every submitted manuscript has been reviewed by one reviewer from the author's native country or university, while the other reviewer came from

Starptautiskās zinātniskās konferences „Ekonomikas zinātne lauku attīstībai" visi zinātniskie raksti sakārtoti trijos tematiskajos laidienos:

Nr.18. Reģionālā un lauku attīstība

Nr.19. Primārais un sekundārais sektors, ražošana, patēriņš

Nr.20. Finanses, nodokļi, investīcijas un atbalsts

Zinātniskajos rakstos izklāstītie pētījumi un to rezultāti kļūst pieejami plašam interesentu lokam Eiropas Savienības telpā.

Rakstu publicēšana pirms konferences sekmēs tās norisi, domu apmaiņu, ekonomikas zinātnieku starptautisko sadarbību. Rakstus varēs izmantot studējošie un visi interesenti.

Konferences zinātnisko rakstu kopsavilkumi angļu valodā tiek izsūtīti starptautiskām datu bāzēm: AGRIS (International Information System for the Agricultural Sciences and Technology) un EBSCO – vienu no lielākajām ASV elektronisko resursu datu bāzēm.

Ceram saņemt atsauksmes un priekšlikumus turpmāko zinātnisko rakstu izdevumu sagatavošanai un starptautisko zinātnisko konferenču rīkošanai.

Pateicamies visiem rakstu autoriem, recenzentiem, programmas komitejai, redkolēģijai un tehniskajam personālam.

Konferences orgkomitejas vārdā
ULDIS IVANS
Latvijas Lauksaimniecības universitātes
Ekonomikas fakultātes asociētais profesors

another country or university. The third reviewer was chosen in the case of conflicting reviews.

All reviewers were anonymous for the authors of the articles. Every reviewer received manuscripts without the authors' names, while every author received the reviewers' comments and objections.

After receiving the improved (final) version of the manuscript the Editorial Board of the conference evaluated each article.

All the papers of the international scientific conference "Economic Science for Rural Development" are arranged into the following thematic volumes:

18. Regional and Rural Development;

19. Primary and Secondary Production, Consumption;

20. Finances, Taxes, Investment and Support Systems.

The researches and their results of the conference proceedings are now available to a wide circle of readers in the European Union. The publishing of the proceedings before the conference will also promote exchange of opinions and collaboration of economic scientists on the international level. The proceedings can be used by students and any interested person.

The abstracts of the conference proceedings provided in English are submitted to the international databases: AGRIS (International Information System for the Agricultural Sciences and Technology) and EBSCO, which is one of the largest electronic resource database in the USA.

We would like to thank all the authors, reviewers, members of the Editorial Board and supporting staff for their contribution organising the conference.

On behalf of the conference organisers
ULDIS IVANS
Assoc.prof. of the Faculty of Economics, Latvia University of Agriculture

Content

Influence of Financial Support on Development of Meat Sector in Latvia

Dina Popluga, Mg.biol., PhD student, Latvia University of Agriculture,
researcher in Latvian State Institute of Agrarian Economics
Kazimirs Špoģis, professor, Dr.habil.agr., Faculty of Economics,
Latvia University of Agriculture Head of Research and Postgraduate Programme

Abstract

Meat has long formed an important part of the Latvian diet, providing a high quality source for Latvian consumer's protein requirements. At the present time meat production and processing are important sectors in Latvia's agriculture and food processing. In terms of production value, it is the third biggest agricultural sector behind the dairy sector and cereals production. In order to promote development of meat sector as well as welfare level of rural inhabitants, Latvia's meat sector, which falls under the European Union's (EU) common market organisation, receives support payments from the EU, and national support or subsidies. The aim of the research was to clarify the influence of financial support on the development of meat sector in Latvia. In order to achieve the set aim the following research objectives were defined: 1) to characterise main support measures and amounts of support in meat sector; 2) to describe Latvia's meat sector and analyse the main tendencies of meat production; 3) to investigate the role of financial support in Latvia's meat sector development. The results of this study showed that financial support has given very great impulse to meat sector's development, as the total amount of pigs and different quality parameters of cattle and pig herds have increased in the sector.

Key words: meat sector, the EU, national support.

Introduction

Amounts of meat production and consumption of meat products in the past 50 years in the world have significantly increased, and often are related with the level of country's development and society welfare. Historically meat production has had important role in the development of humanity, society and agriculture. However, it still takes important role providing country's economic welfare and growth (Steinfeld H. et al., 2006).

At present market economy development of meat production in the primary sector is affected by several science branches and society interests. Therefore new possibilities, problems, issues, topicalities, and aspects of meat production are discovered all the time, which demand further scientific research. This issue has become very topical in Latvia as in the past years meat production sector has experienced different structural changes (Melece L., Popluga D., 2008; Romanova D., 2008; Špoģis K., Radžele A., 2007; Runce A. et al., 2006).

However, information on aspects of financial support and development of meat sector has not been published yet. Taking into account that the main aim of support payments from the EU and national support or subsidies is to promote development of meat sector as well as welfare level of rural inhabitants, it is very important to investigate how effectively this aim is reached.

Such evaluation of current situation encouraged to carry out this research, and let us highlight the following **hypothesis**: the EU and national support are important factors affecting the development of Latvia's meat sector.

The aim of the research was to clarify the influence of financial support on the development of meat sector in Latvia.

In order to achieve the set aim the following **research tasks** were defined:

1) to characterise main forms and disbursed amounts of support in meat sector;
2) to describe Latvia's meat sector and analyse main tendencies of meat production;
3) to investigate role of financial support in Latvia's meat sector development.

The following **materials** were used: annual statistical data, scientific publications, specialised literature and reports of national governmental institutions to meet the study objectives.

Both qualitative and quantitative **research methods** were used in this study: analysis and synthesis, data grouping, logical, and abstract constructive methods.

Results and discussion

EU and national support measures for Latvia's meat sector development

Latvia's meat sector receives financial support both from the EU budget, and from the national budget. In order to investigate the amount of funding Latvia's meat sector receives every year, we have summarised the main EU and national support measures and disbursed amount for meat sector in this study. As Latvia receives the EU funding since it has joined the EU in 2004, we focused on and analysed time period from 2004 to 2007.

EU support

The EU policy relating to meat has evolved over many years and is increasingly focused on improving the quality of the product; on giving farmers confidence in their future income prospects and on encouraging more environmentally-sustainable farming practices (European Commission, 2004). Currently, only farmers producing beef and sheep meat receive the EU support, where funding is allocated according to direct payments policy.

Direct payments

Based on the changes introduced in the EU legislation by the European Commission, all the EU Member States had to implement a reform of complementary national direct payments in 2007, ensuring that within the limits of granted financing complementary national direct payments are implemented as two types of payments: production linked payments and decoupled payments (Ministry of Agriculture, Republic of Latvia, 2008).

Thus in 2007, Latvia's meat farmers could apply for various EU direct payments:

- single area payment;
- complementary national direct payments for:
  - fodder areas;
  - slaughtered or exported bovine animals;
  - suckling cows;
  - ewes.

In 2007, the following new direct payments were introduced and available to meat farmers: decoupled complementary national direct payments for slaughtered or exported bovine animals. The EU support measures and disbursed amount for meat sector in Latvia are summarised in Table 1.

Complementary national direct payment for fodder areas

Fodder area payments were granted for areas used to obtain of rage or for graze animals. In 2007 for fodders areas Latvia's farmers received 3.14 mln. LVL, which was for 10.5% less than in previous year.

Complementary national direct payment for suckling cows

In 2007 the maximum amount of financing available as complementary national direct payment for suckling cows was LVL 1.79 mln. According to the data arranged in Table 1 the disbursed amount of complementary national direct payment for suckling cows in the past four years has increased almost eight times – from LVL 0.26 mln. to LVL 1.79 mln.

Complementary national direct payment for slaughtered or exported bovine animals

In comparison with 2006, the total amount of complementary national direct payment for slaughtered or exported bovine animals available to

Table 1

The EU support measures and disbursed amount (mln. LVL) for meat sector in Latvia, 2004 - 2007

Support measure	2004	2005	2006	2007
Single area payment	17.91	26.70	32.89	39.82
Complementary national direct payment				
for fodder areas	3.99	4.08	3.51	3.14
for suckling cows	0.26	1.81	0.95	1.79
for slaughtered or exported bovine animals	4.45	6.57	6.92	2.80
for ewes	0.09	0.16	0.14	0.18
Decoupled complementary national direct payment				
for slaughtered or exported bovine animals	-	-	-	4.20
Export refunds (LVL)				
for pork	-	-	-	152
for beef and veal	-	6 221	-	-

Source: Ministry of Agriculture, Republic of Latvia, 2008; 2007

farmers in 2007 was smaller, as part of the financial envelope was to be disbursed as decoupled payments (for the production of the previous reporting period). Consequently, the overall amount available to Latvian farmers as complementary national direct payments for slaughtered or exported bovine animals in 2007 was LVL 2.80 mln.

Complementary national direct payment for ewes

In 2007 the farmers who applied for the complementary national direct payment per ewes received LVL 0.18 mln. Disbursed amount of this support type has not changed substantially comparing with previous years.

Decoupled complementary national direct payment for slaughtered or exported bovine animals

Decoupled complementary national direct payment for slaughtered or exported bovine animals could be received in 2007 by farmers who were the beneficiaries of the complementary national direct payment for slaughtered or exported bovine animals in 2006, and who were compliant with the single area payment eligibility provisions in 2007. The maximum amount of financing available as decoupled complementary national direct payment for slaughtered or exported bovine animals was LVL 4.20 mln. in 2007.

Export refunds

The possibility to apply for the export refunds to the definite basic and processed agricultural products is one of the most essential attainments following the accession to the EU. In order to be able to compete with the world markets by exporting separate agricultural products to the third countries, the export refunds cover the difference between the prices of the EU internal market and the markets of the world (Ministry of Agriculture Republic of Latvia, 2005). Concerning meat sector in 2007, export refunds in Latvia were disbursed only for pork, while Latvia's businesses had not applied for beef.

National support

In order to foster agricultural and rural development as well as to improve living standards of the rural population, the state provides support or national subsidies in addition to the EU support. In 2007, total subsidies for meat sector development amounted to LVL 4.43 million (Table 2).

In 2007 national support for different animal breeding sectors has increased in comparison with the previous years. When looking at the considerable differences in comparison with 2006 it has to be borne in mind that the year 2007 was a complicated year for the Latvian pig sector, as at the beginning of the year the situation became quite critical. Negative pork market developments were caused by the high prices of grain, export restrictions to Russia and Ukraine, rising resource costs and inflation as well as other factors (Ministry of Agriculture, Republic of Latvia, 2008). In order to ensure stabilisation of pig sector and raise the competitiveness of outputs, Latvia's government notably raised amount of subsidies (more than 3 times in comparison with 2006) for pig sector.

Development of meat sector in Latvia

In order to analyse the influence of financial support on the development of meat sector in Latvia we have described and investigated main tendencies of animal breeding and meat production. Taking into account that pork, beef, veal, and poultry are the major meat products in Latvia; however, other kinds (mutton and goat meat, horse meat, rabbit meat) are also produced in small quantities and that development of meat sector is closely related to the development of cattle, pig and poultry sectors, we have given short overview on these sectors and their main development tendencies.

In the past four years there can be observed tendency showing that the number of pig and cattle herds constantly decreases. For example the number of cattle herds during 2004 and 2007 has decreased by 31%, but number of pig herds during 2006 and 2007 - by 16%. Although the overall number of pig herds has decreased, the number of pigs grew from 347.1 thousand in 2006 to 357.9 thousand in 2007, representing the increase of 4%. Here we would like to point out that with the state support, the number

Table 2

National support measures and disbursed amount (mln. LVL) for meat sector, 2004 - 2007

Measures	2004	2005	2006	2007
Support for breeding and animal growing in cattle – breeding sector	0.12	0.20	0.30	0.36
Support for breeding and animal growing in pig – breeding sector	0.73	0.81	1.1	3.9
Support for breeding and animal growing in sheep – breeding sector	0.05	0.06	0.11	0.09
Support for breeding and animal growing in goat – breeding sector	0.03	0.04	0.04	0.08
Total support for meat sector development	**0.93**	**1.11**	**1.55**	**4.43**

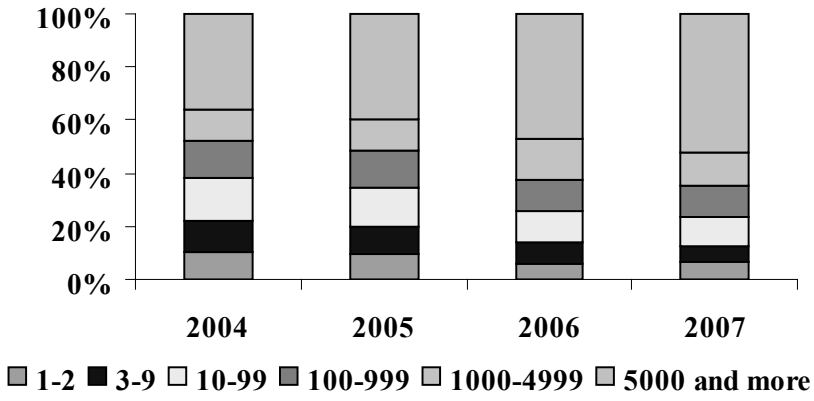
Source: Rural Support Service, 2008

Table 3

Number of pig, cattle, sheep and goat herds and animals in Latvia, 2004– 2007

	2004	2005	2006	2007
Number of herds				
Pig herds	2543	3875	3382	2835
Cattle herds	71802	64255	56349	49605
Sheep herds	3372	3729	3932	4172
Goat herds	1699	2126	2385	2634
Number of animals				
Pigs	340296	320861	346993	357974
Cattle	376547	396498	403694	390808
Sheep	30913	42697	54212	62345
Goats	6759	8626	10552	12320

Source: Agricultural Data Centre, 2008



Source: Central Statistical Bureau of Latvia, 2008; 2007; 2006; 2005

Figure 1. **Distribution of total pigs by the number of pigs per farm in Latvia (%), 2004 - 2007**

of sows in herds was preserved and even increased slightly over 2007.

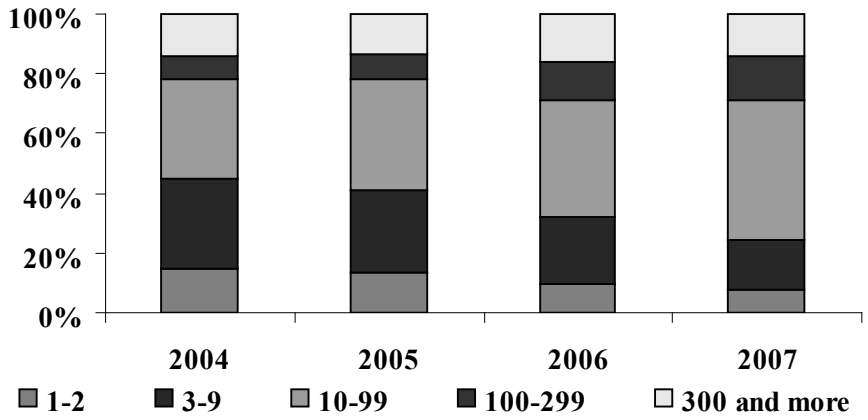
Positive development tendency of sheep and goat sectors, where the number of herds and animals in the past four years has significantly increased can be also observed (Table 3).

Analysing the division of number of pigs by farm groups it was concluded that within changes in the pig farms structure, regrouping and restructuring of pig sector has occurred and still takes place. In 2004 bigger share of total pigs (expressed in percentage) was concentrated in farms with more than 5000 pigs (36%) and in farms with 10 to 99 pigs (16%). But in 2007 more than half of all pigs – 52%, were bred in the largest farms (with more than 5000 pigs) (Figure 1).

Although changes in distribution of total cattle by number of cattle per farm were not as significant as in pig sector, similar restructuring processes can be observed in cattle sector. Tendency shows that in 2004 bigger share of total cattle was concentrated in farms with 10 to 99 cattle (34%) and 3 to 9 cattle (30%). But in 2007 almost half of all cattle were bred in farms with 10 to 99 cattle (47%) and in farms with 100 to 299 cattle (15%) (Figure 2).

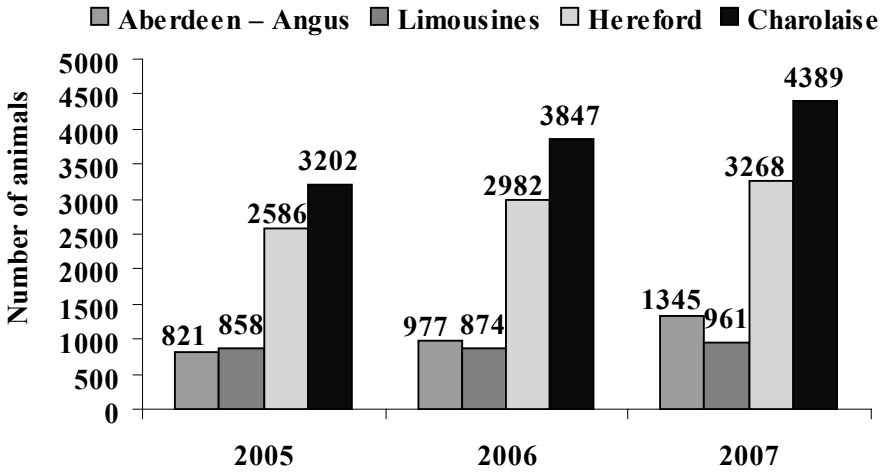
According to C. Hubbard and co-authors (Hubbard C. et al., 2007) one of the major factors driving these structural changes has been technology where most important factor encouraging the development and uptake of productivity enhancing technologies has been the successful attraction of the EU and national funding.

The sector of breeding the specialised meat cattle is comparatively new; its development was started just 14 years ago by commencing to breed the cattle of the Sharole, Hereford, Limousine and Angus breeds (Ministry of Agriculture, Republic of Latvia, 2005).



Source: Central Statistical Bureau of Latvia, 2008; 2007; 2006; 2005

Figure 2. **Distribution of total cattle by the number of cattle per farm in Latvia, 2004 – 2007**



Source: Agricultural Data Centre, 2008

Figure 3. **Changes in the number of meat breed's cattle in the monitored Latvian herds, 2005 - 2007**

Table 4

Meat production in Latvia (tons), 2004-2007

Type of meat	2004	2005	2006	2007
Beef and veal	21587	20444	20684	22755
Pork	36808	38450	37812	40433
Mutton and goat meat	365	428	439	493
Poultry	14265	17203	20608	20551
Other	208	194	202	184
Total amount of meat (slaughter weight)	**73233**	**76719**	**79745**	**84416**

Source: Central Statistical Bureau of Latvia, 2008a; 2006a

However, analysing the data from 2004 to 2007 we can conclude that a national support programme (Support for breeding and animal growing in cattle – breeding sector) and the EU support measures have positively influenced development of beef sector in Latvia (Figure 3). If in the year 1997 there were only

few hundreds of specialised meat breed animals and their crossbreeds in Latvia, then in 2007 this number was 16 095 animals (Agricultural Data Centre, 2008). This is a remarkable progress for the sector which previously was not developed.

Increasing number of animals has promoted production of meat. In 2007 beef and veal production has increased for 5%, pork production – for 9%, mutton and goat meat production – for 26% in comparison with 2004 (Table 4).

In total, the analysis of main development indicators (number of livestock population, farm size, meat production amounts) of Latvia's meat sector shows that, although the time period from 2004 to 2007 is a relatively short for a robust analysis, since the EU accession there have been some significant changes in Latvia's meat sector.

Conclusions

1. Structural change has been the principle characteristic of the Latvian meat sector in recent years, where structural changes can be defined as changes in the number and size of farms in pig and cattle sectors.
2. The data analysis shows that the total number of animals (pigs, cattle, sheep and goats) in the past four years has increased, and there are introduced new breeds with improved quality traits.
3. National and the EU support measures have positively influenced development of beef sector, because if in 1997 there were only few hundreds of specialised meat breed animals and their crossbreeds in Latvia, then in 2007 this number was 16 095 animals.
4. Current tendencies that can be observed in Latvia's meat sector – livestock population, farm size and reproductive material (sows, specialised meat breed's cattle), which are influenced by the EU and national support – are favourable in order to ensure the increase of meat production in the next years.

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Kopsavilkums

Gaļa vēsturiski ir bijusi un joprojām ir viena no svarīgākajām Latvijas iedzīvotāju uztura sastāvdaļām, kas nodrošina organismam nepieciešamās olbaltumvielas. Pašlaik gaļas ražošana un pārstrāde ieņem nozīmīgu lomu lauksaimniecības preču produkcijā un lauksaimnieku ienākumu veidošanā. Lai sekmētu gaļas nozares attīstību, kā arī paaugstinātu dzīves līmeni lauku teritorijas iedzīvotājiem, Latvijas gaļas nozare, kas ietilpst ES koptirgus organizācijā, saņem ES atbalsta maksājumus un valsts atbalstu jeb subsīdijas. Pētījuma mērķis bija noskaidrot atbalsta politikas ietekmi uz gaļas nozares attīstību Latvijā. Lai sasniegtu izvirzīto mērķi, tika definēti sekojoši pētījuma uzdevumi: 1) noskaidrot galvenos gaļas nozares atbalsta maksājumu veidus un apmērus; 2) raksturot gaļas nozari un galvenās tās attīstības tendences Latvijā; 3) noskaidrot atbalsta politikas lomu kopējā gaļas nozares attīstībā. Pētījuma rezultāti liecina, ka atbalsta politika ir devusi ļoti lielu stimulu nozares attīstībai, jo Latvijā ir palielinājies kopējais cūku, liellopu, aitu un kazu skaits, ganāmpulkos tiek ievesti gan ģenētiski augstvērtīgi gaļas liellopi, gan cūkas ar lielāku diennakts vidējo dzīvmasas pieaugumu un liesās gaļas procentuālo saturu, kā arī notiek cūku un liellopu audzēšanas saimniecību restrukturizācija un koncentrācija.

Economics and Competitiveness in Secondary Agricultural Production: the Case of Feta Cheese in Greece

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Abstract
Cheeses made of goat and sheep's milk belong to the category with the largest share in the overall production of cheese products in Greece. More specifically, feta cheese, which is a soft cheese made of goat and sheep's milk, holds a significant position in the total industrial production of this sector. Following the European Commission's ruling to establish Greek feta cheese as a product of protected designation of origin (P.D.O.), major opportunities have been created for exports and further development. The present paper is based on a survey conducted on a sample of cheese-making enterprises in Greece. The collection of the data was made using a specially prepared structured questionnaire. The objective of the study is to examine the competitiveness of cheese-making enterprises, and explore the possibility of their receiving funding, as a driving force for agricultural development and for the exploitation of the goat and sheep farming sectors. In order to study the competitiveness of cheese-making enterprises, an assessment of basic financial results was carried out. Finally, a grouping of the cheese-making enterprises was attempted, as regards the main economic parameters that are linked to their competitive profile. The results of the survey are expected to facilitate the implementation of rural policy measures that will improve the competitiveness and economics of the enterprises in question. This paper is based on the research carried out within the framework of the project entitled "Investigation of investments potential for modernisation and development of milk processing units: the case of cheese-making units in Central Macedonia, Greece" and funded by the Researches Committee of Alexander Technological Educational Institute of Thessaloniki.
Key words: competitiveness, economics, feta, cheese-making enterprises.

Introduction
Animal breeding in Greece is a particularly significant primary production sector, due to the country's long tradition in this field. Sheep and goat farming is one of the most dynamic sectors in animal production, with a contribution to the total agricultural income of approximately 20%. This type of farming is viewed as a popular option in the current framework of agricultural economy in Greece; its share in the total gross animal production value and total agricultural production value is approximately 45% and 15% respectively (Papatheodorou et al, 2006). Sheep and goat farming also has an added importance for Greece, given the fact that it is practised in mountainous-disadvantaged regions that cannot be valorised in any other way. Overall, it is an extensive form of activity, with an impressive number of stabled-intensive farming units being developed in recent years (Ministry of Agricultural Development and Food, 2006).

Approximately 100.5 million sheep and goats are currently bred in the EU. The major players in sheep breeding are Great Britain with 24.4 million, Spain with 22.5 million, Greece with 9.1 million animals, France with 8.8 million, and Italy with 8 million (EUROSTAT, 2005). As regards goat breeding, Greece tops the list in Europe with 4.8 million animals, followed by Spain with 2.9 million, France with 1.2 million, and Italy with 960 thousand animals (EUROSTAT, 2005).

The dominant form of Greek sheep and goat breeding farms consists of small, family-run, extensive breeding units, which differ greatly as regards their size, stabling facilities, production level, etc. In recent years, the number of small, nomadic-style units seems to be reducing, and large, organised, "closed"-type units seem to be prevalent (Apostolopoulos and Rogdakis, 1996; Hadjigeorgiou, *et al*., 1999; Karagiannis and Tzouvelekas, 2005). More specifically, it is estimated that 110,000 families are involved in sheep and goat dairy farming, with the production of milk amounting to 1.1 million tons (which is equal to 25-30% of the amount produced in the European Union). Meat production is at a level of 115 thousand tons (Ministry of Rural Development and Food, 2006). The largest quantity of goat and

sheep's milk (about 75%) is used for the production of cheese products (feta cheese, kasseri) on an industrial level and at family businesses (cottage industry). The remaining amount is either used for the production of other traditional products (e.g., yoghurt) or for self-consumption by the producers (Ministry of Rural Development and Food, 2007).

In 2005, the production of cheeses made of sheep or goat's milk amounted to 75.3% of the total cheese production volume of Greece. More specifically, soft sheep/goat cheeses constitute the predominant category, since their contribution to the total production is calculated at 59.5%. The above-mentioned category is estimated to have accounted for 73.1% of the total amount of domestically-produced cheeses that were consumed in 2004; it is also the category with the largest export activities in comparison to the other types of cheese (the export volume of this particular category in relation to the produced quantity was equal to 37.7%) (ICAP 2006).

Feta cheese belongs to the group of soft sheep/goat cheeses and is the type of cheese which has always held the greatest share in the total production of cheese products (52.9% in 2004) (ICAP 2006). According to the Greek legislation, traditional feta is a soft white cheese in brine that is produced from sheep's milk or a mixture of sheep and goat's milk (the share of goat's milk is up to 30%) in regions of Greece designated by the law (Greek Codex Alimentarius, 1998). Based on the Regulation 1829/2002/EC, Article 2, feta cheese was established on the register of Greek "Protected Designation of Origin" (P.D.O.) cheeses and, since October 15, 2007, it can only be produced exclusively in Greece (Commission Regulation, 2002). The establishment of feta cheese as a PDO product has resulted in an increase of its export volume, as a cheese that is internationally acclaimed. Feta and teleme cheese accounted for 42.6% of the total cheese products exported from Greece in 2004 (16.5% of the produced quantities of these particular types of cheese is exported). The main importing countries are Germany, Great Britain and Italy (ICAP 2006).

The number of enterprises involved in feta cheese production is significant; they are mainly located around the regions of Thessaly, Macedonia, Peloponnese, and Epirus. These specific regions represented 81% of the total production of feta in 2005 (NSSG., 2006).

Feta production enterprises are characterised by a wide dispersal, and the existence of a large number of small and medium-sized cheese making facilities (mostly of a local character) as well as some large industrial units. The small and medium-sized feta production enterprises seem to face problems in locating the funding that is required for investments to be made in mechanological equipment, for the upgrading of their production facilities and the standardisation of their products (ICAP, 2006). It is worth noting that only five large-scale feta production enterprises account for 31% of the total produced volume. The major producers of cheese products use modern machinery, which is regularly renewed in order to effectively respond to the requirements and new conditions of the marketplace. Within this framework, they apply standardisation practices to a large percentage of their production, thus supplying their products in various forms and packaging suggestions that have become increasingly popular in recent years. Certain industrial units have also been involved in the acquisition or takeover of small and medium-sized production units, thus achieving economies of scale.

The objective of this paper is to examine the economic profile of the cheese making enterprises and the prospects for improving their competitive profile. Furthermore, an attempt is made to define the typology of the enterprises in question, in order to draw conclusions regarding their potential for further development, as a driving force for a substantially competitive sector of the rural economy.

The tasks of this research are:

- to examine the financial status of the cheese making enterprises;
- to arrange the cheese making enterprises into groups according to their basic economic parameters;
- to study any statistically significant differences that exist among the cheese making enterprises as regards the identified economic parameters;
- to discuss the restructuring requirements of the cheese making enterprises;
- to explore any correlations between the above-mentioned economic parameters.

Materials and methods

The region selected for the application of this research is one of the most productive regions of Greece, both as regards the production of sheep and goat's milk, and in feta cheese production. It is the Region of Central Macedonia, which comprises the Prefectures of Thessaloniki, Kilkis, Imathia, Pieria, Serres, Pella and Halkidiki. The variety of the production conditions in these areas, along with the significant quantities of produced feta cheese, allow for a generalisation of the results of this research for the whole of Greece, without any major deviation from the real picture. The technical-economic data in this study refer to the period 2007-2008, and were collected using specially structured questionnaires. This manuscript is based on the research carried

out within the framework of the project entitled "Investigation of investments potential for modernisation and development of milk processing units: the case of cheese-making units in Central Macedonia, Greece" and funded by the Researches Committee of Alexander Technological Educational Institute of Thessaloniki.

The sampling method that was used to determine the sample was proportionate stratified sampling per region and size of the cheese making units (Apostolopoulos, *et al*., 2001; Galanopoulos, *et al*., 2006). Thus, the sample consists of 32 cheese making enterprises, a figure that represents 68% of the total number of businesses in the selected areas. The cheese making enterprises included in the sample mainly use sheep and goat's milk in their production process, and specialise in the production of "feta cheese".

Based on the technical-economic data of the units in the sample, we can identify their basic economic results. The data used for the implementation of the research were a) gross revenue, b) total annual fixed capital expenses, c) variable capital cost, d) wages for permanent staff, e) production capacity, f) loan size, and g) capital stock. The term production capacity is used to denote the amount of raw material (milk) in tons that the cheese making enterprise is able to process during an 8-hour shift. The selected economic parameters are particularly important, since they are factors that play a major role in restructuring the operations of cheese making units and improving their competitiveness (Doll and Oragen, 1984; Kitsopanidis and Kamenidis, 2003). The questionnaires were then used to record the educational level of the enterprise owners in the sample, the application of quality assurance systems, the employment of specialised geotechnical engineers to be responsible for the production process and quality management, and the potential of securing funds through subsidy programmes. The study of these parameters is related to the capacity of the enterprises to produce high-quality cheese products, and to be included in subsidy programmes for their restructuring and modernisation, in order to improve their overall competitiveness.

Based on the above-mentioned economic results, Hierarchical Cluster Analysis was used to develop the typology of the cheese making enterprises. Ward's criterion and the Squared Euclidean Distance were used to form the clusters (Hair *et al*. 1995, Sharma 1996). The analysis was carried out using the SPSS V. 11.5. The stability of the results of the Cluster Analysis, in relation to the order in which the cheese making units were entered in the analysis, was checked with the help of the PermuCLUSTER v.1.0. software (Spaans and Van der Kloot, 2004).

Finally, Pearson's Correlation coefficient was used to examine the relations between the selected economic parameters.

Results and discussion

The Hierarchical Cluster analysis identified two clusters of enterprises: the first cluster consists of 20 enterprises (62.5%), and the second one consists of 12 enterprises (37.5%). The first level cluster analysis, based on the defined parameters, is presented in Table 1. Table 2 includes the divergent trends in the selected economic parameters for each cluster of cheese making enterprises. Based on the data presented in Tables 1 and 2, we see that the enterprises in cluster C_1 present a high capital stock, but a low variable capital cost, low annual fixed capital expenses, a small production capacity and a small loan size. The enterprises in this cluster seem to attain a lower gross revenue and higher wages for permanent staff. The enterprises in cluster C_2 present a high level of annual expenses and variable capital cost, and are also characterised by a large loan size and a high production capacity. These enterprises have a limited capital stock, and seem to attain higher gross revenue and a lower wages for permanent staff. According to the cluster analysis, the enterprises in the first cluster have a low turnover, and operate from old building facilities, using outdated mechanic equipment. They can only process a limited amount of primary and secondary materials, and have high costs for permanent staff. These enterprises are mainly financed by owned capital stock.

The enterprises in the second cluster operate in modern building facilities using the latest equipment, and achieve a high turnover. Their production capacity is high, they can process large quantities of sheep and goat's milk and secondary materials, and they exercise better management practices as regards the employment of staff. However, these enterprises depend on loan capital to a great extent, and have a low capital stock level.

Based on the correlation coefficient R^2 (Table 1), the relative significance of the variables, that were used for the formation of the clusters is presented in descending order: Loan size, production capacity, total annual expenses, permanent staff expenses, capital stock level, variable capital cost and gross revenue.

At the next stage, the second level profile for both clusters of cheese making enterprises was examined (Table 3). The following parameters were selected in order to study the second level profile:

1. Application of Quality Assurance Systems (2 options)
2. Educational level of owner (3 options)

Table 1

Economic characteristics of the cheese making enterprises in the clusters

Clusters of cheese making enterprises	Total Annual Expenses (in euros)	Capital Stock Level (in EUR)	Loan Size (in euros)	Production Capacity (in ton /8h)	Permanent Staff Expenses (in EUR)	Variable Capital Cost (in euros)	Gross Revenue (in EUR)
Cluster 1:							
Mean	122,430[b]	1,185,500[a]	60,482[b]	7[b]	117,850[a]	711,380[b]	1067212[a]
Size	20	20	20	20	20	20	20
Cluster 2:							
Mean	165,264[a]	871,667[b]	215,679[a]	15[a]	85,333[a]	919,492[a]	1,274,371[a]
Size	12	12	12	12	12	12	12
Mean	138,493	1,069,688	118,675	10	105,656	789,422	1,144,897
R^2	0,370	0,345	0,886	0,779	0,366	0,300	0,169

*Means located in the same column and followed by a different letter, present a statistically significant difference, at a significance level α=0,05, according to the results of the t- test (Toothacker, 1993).

Table 2

Economic parameter trends in relation to the cluster means

Economic Variables	Clusters	
	C_1	C_2
Total Annual Expenses	↓	↑
Capital Stock Level	↑	↓
Loan Size	↓	↑
Production Capacity	↓	↑
Permanent Staff Expenses	↑	↓
Variable Capital Cost	↓	↑
Gross Revenue	↓	↑

3. Inclusion of enterprise in a subsidy programme (2 options)
4. Employment of geotechnical engineers (2 options)
5. Potential for further modernisation and expansion (2 options)

It is observed in this table (Table 3) that the cheese making enterprises in cluster C_1 present a limited employment of specialised Geotechnical Engineers; they also have a low potential for further modernisation and expansion, and only a small percentage have been included in subsidy programmes. It is worth noting that a significant number of these enterprises (40%) do not apply integrated quality assurance systems, and the educational level of their owners is equivalent to secondary school level (60%). The cheese making enterprises in cluster C_2 present a substantial employment of specialised

Geotechnical Engineers; they have an increased potential for further modernisation and expansion, and a large percentage of these enterprises are included in subsidy programmes. All the enterprises in the cluster apply integrated quality assurance systems, and the educational level of their owners is high (Tertiary education: 58%).

Next, the correlations of the economic parameters of the cheese making enterprises were examined using Pearson's Correlation coefficient. This analysis detected a positive very strong statistically significant correlation between the variable capital cost and the gross revenue (r=0.772, p=0.001), a positive strong statistically significant correlation between the total annual expenses and the gross revenue (r=0.544, p=0.001) as well as a positive moderately strong statistically significant correlation between the production capacity and the gross revenue (r=0.354, p=0.047). Furthermore, a positive strong statistically significant correlation was detected between the

Table 3

Second level profile of the clusters

Socio-economic Factors		Cluster 1 (C_1) N:20		Cluster 2 (C_2) N:12	
		No of enterprises	(%)	No of enterprises	(%)
Application of Quality Assurance Systems	YES	12	60[b]	11	92[a]
	NO	8	40	1	8
Educational level of owner	Higher	4	20[b]	7	58[a]
	Secondary	12	60[a]	4	33[a]
	Elementary	4	20[a]	1	9[a]
Inclusion of enterprise in a subsidy programme	YES	6	30[b]	8	67[a]
	NO	14	70	4	33
Employment of geotechnical engineers	YES	3	15[b]	10	83[a]
	NO	17	85	2	17
Potential for further modernisation and expansion	YES	4	20[b]	12	100[a]
	NO	16	80	0	

*For each parameter percentages (%), in the same line and followed by a different letter, present a statistically significant difference, at a significance level α=0,05, according to the results of the Exact χ^2-test (Metha and Patel, 1996).

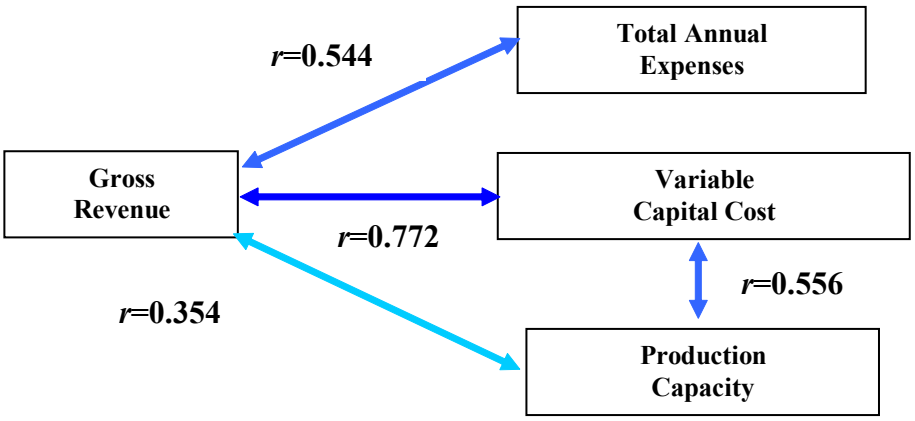

Figure 1. **The correlations of the economic parameters**

production capacity and the variable capital cost (r=0.556, p=0.001). The correlations of the economic parameters are presented in Figure 1.

The above-mentioned correlations show the high dependence of the high productivity levels of these enterprises on the processed quantity of sheep and goat's milk. In addition, the major effect of the fixed capital on the formulation of a high turnover and the attainment of high productivity is also observed.

Conclusions - Proposals

Through the application of Hierarchical Cluster Analysis it was possible to highlight and provide a detailed description of various types of cheese making enterprises with particular economic and production characteristics. The results show that the enterprises in the first cluster present several weaknesses. The existence of outdated building facilities and insufficient mechanic equipment restricts their capacity to process raw material (sheep and goat's milk) to only a limited amount, thus leading to a low turnover. These enterprises seem to face problems in securing capital in order to realise the necessary investments in equipment, and to upgrade their production units. They are primarily financed by owned capital stock. The enterprises in the second cluster appear to be more modern as regards their building facilities and machinery. The cutting-edge equipment of the enterprises in question leads to a better valorisation of the workforce, a reduction in the cost of use of the "labour" coefficient, and a high turnover also. The latter enterprises have a high production capacity, and thus make use of large quantities of sheep and goat's milk. Nevertheless, these enterprises mainly spend loan capital for their modernisation, and their capital stock value is low.

As we can see in the typological analysis, there are many cheese making enterprises that face problems in securing capital in order to realise essential modernisation tasks (Cluster C_1). What is recommended is that they are included in subsidy programmes, but only if this step is accompanied by a parallel increase in their production capacity (there are substantial subsidy programmes available for the modernisation of processing enterprises, based on the Development Law and the Operational Programme of the Ministry of Rural Development). More specifically, through their inclusion in the NSRF (National Strategic Reference Framework) offered by the EU, it is expected that the required financial resources will be secured, on favourable financing terms. The modernisation of the enterprises in cluster C_1 will lead to an increase in their productivity levels. These cheese making enterprises will have to invest in the application of quality assurance systems, since a large percentage of the enterprises in question do not apply such quality management methods. The employment of specialised geotechnical engineers will lead to an improved implementation of such practices by these enterprises.

As regards the cheese making enterprises in Cluster C_2, what is recommended is a further increase in the owned capital and the capital stock, along with a gradual reduction of the dependency of this cluster's enterprises on loans (Cluster C_2). The cheese making enterprises in this cluster are in a position to make special investments in quality issues in order to increase their competitiveness and be in a better position to respond to the challenges and new conditions of the market.

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Production Resources and their Use in Farms of Varied Relations with the Environment in Poland[1]

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Abstract

The volume of the agricultural production depends, most of all, on the quantity and type of the factors applied in production. Changes of the production resources and the efficiency of their utilisation may become a marker to assess the situation of farms and predict the development of agriculture. Production resources in agriculture allow achieving specific volume of production, which is directly transferable on the amount of the gained profit.

Farms are distinguished by different rates of development, which is conditioned by many factors. Apart from the external factors (components of the environment), one should point to the internal conditions of the farm. It is estimated that the internal forces are decisive in achieving success on the market on particular conditions (country, region). It all depends on the entities themselves – how they would use their chances offered by the environment and actions they would take to avoid danger.

The external environment has a great influence on the entity, complicating the situation and hindering decision taking and effective management. Many businesses cope in a changing environment, while others are liquidated, which is a mark of the role of the business's internal potential (Adamowicz 2002). The potential is related to both, the material factors of production (such as the soil, labour force resources, fixed and current assets, etc.), and the non-material factors (knowledge, skills, competence of the management, access to information, etc.). Winning the competitive advantage is possible when the business has appropriate resources at its disposal and uses them efficiently.

The material will present the diversification in the use of the production potential on the Polish farms, depending on their market activeness (relations with the environment). The analysis covers the soil and labour resources. The main emphasis will be placed on the efficiency of using these resources on farms with diversified relations with the environment (market). It will also present the general development trends for farms in Poland, together with their connections with the market.

Key words: production resources, private farms, market agriculture output, agricultural land area.

Introduction

Farming activity on the market economy conditions poses high requirements for an agricultural producer. Agriculture in Poland included in the European Union structures must stand up to the Western European competition. Such a situation requires good management of an agricultural enterprise, so that it can find its place in the changing environment.

At present it is more and more often emphasised that the environment is more and more "complicated" for enterprises. The original natural environment is enlarged with subsequent elements, directly or indirectly affecting the units functioning there. On the present farming conditions, farmers do not have the complete freedom to take production decisions; they are often dependent on numerous environmental conditions.

At the present stage of development of agriculture, the change of appropriation of agricultural products from the internal use farm (internal consumption) into delivery to market (commodity) takes place more and more often. In order to stand up to the challenge, farmers are obliged to apply modern production methods, in case of which internal production resources (own outlays) are not sufficient. So the role of production resources of industrial origin (from outside the farm) is growing, which is related to the role of environment in the functioning of farms.

In Poland there is a big group of the so-called social farms, in which agricultural activity is not run in order to sell their products (Sikorska A., 2003). About 46%

[1] Study undertaken within the framework of a grant of the Ministry of Science and Higher Education No N115 0439 33.

of individual farmsteads functioning in Poland do not run market activity, 6% do not run agricultural activity at all and only 48% are farms producing mainly for the market (PSR, 1996, 2002). Therefore the study encompasses the problem of relations of farmsteads with the environment and presents one of the issues related to the use of production potential, depending on the market activity of farms (interrelations with the environment).

In order to implement the production process in an enterprise it is required to possess specified resources, indispensable to run the production process, mainly: land, work and capital. The study includes an analysis of land and work resources as well as the effectiveness of use of those resources in farms of varied relations with the environment.

The size of production that can be produced in a certain time by an enterprise with certain production resources and specified production methods is called the production capacity. So production capacity depends directly on the size of resources and the ability to use them. There can be many possibilities to use the possessed resources, but their size in a farmstead is most often fixed and limited; thus it is difficult to change it in a short term. The level of some production factors can be changed quite fast, whereas a change of the level of other factors can take a long time. In individual farmsteads it is often impossible on the account of natural limitations. The resources of production factors in agriculture are characterised by limited mobility. It is related mainly to land. There is no possibility to "move" it from one place to another as need arises. A farmer who wants to enlarge the area of a farm (increase land resources) will not do that, if there is no land supply in the area (possibility to purchase it or lease). It means that agricultural land is subjected to limited transfers. Thus one should pay special attention to the effectiveness of its use. According to Ziętara (2000), the issue of land resources and work plays a very important role within the framework of the problem of balance between those production factors in farmsteads. The lack of such balance is the reason for difficulties not only in agriculture, but in the whole economy. Therefore this issue is still up to date and worth studying.

Another factor analysed in the study constitutes work outlays. High workforce resources are characteristic for Polish agriculture. In 2007 the agricultural sector employed 15.6% of the total number of people who produced 2.7% of gross domestic product[1]. So, the effectiveness of people employed in agriculture is low. Despite this fact Poland is the producer of a number of products: agricultural, horticultural and of animal origin important in the world and in Europe.

Objective and research methods

This study is aiming at specifying the effectiveness of the use of production resources in individual farmsteads in Poland depending on their relations with the market and environment[2]. The main emphasis was put to differences in the level of effectiveness of land and work. At the beginning resources possessed by farms are presented, and then the effectiveness of their use is emphasised against the background of the general tendencies of agricultural development. For the purpose of analysis, farmsteads running agricultural accounting in relation to FADN (Farm Accountancy Data Network) were selected. From the total number of farms, 610 were selected by drawing lots, from which group 225 were selected on purpose, so that groups of farms of the economic size from 4 to 40 ESU are represented as well as five most common production types (field farming, milk farms, farms with the pasture system, farms growing granivore animals and mixed). A group of farms selected this way was divided according to the environment relations index. In order to design this index, systematic approach was adopted, taking into account elements of the farm "input" and "output" interrelations (Steffen G., Born D., 1987). For the purpose of setting input factors, the following factors were taken into account: outlays for the active assets, farmers' use of services, of the hired workforce, of the purchase of production materials from long-term suppliers, of hired financial resources (e.g., loans) as well as elements such as participation in training, ODR (Agricultural Advisory Service Centre) consulting, land lease, co-operation with science, and computer use. The output factors include: share of commodity production in the size of the created (global) production, sale to long-term customers, rendering services, participation in organisations, producer groups, and work outside of the farm, land lease, and environment protection activities. As the importance of various input and output factors varies in relation to the assessment of interrelations with the environment, the weighted assessments were introduced. At the next stage of research, farms were grouped according to the size of an index. For this

[1] Share of agriculture in the production of gross domestic product in Poland has been systematically decreasing. In 1990 it was even 7.2%.

[2] The notion of environment of farms according to Woś [1996] can be understood as everything happening outside of a farm.

purpose, every year farms were ranked from the lowest to the highest value of the index and a division into groups with the use of quartiles was made. So, a group of 25% units of the group with the index value below the value of the first quartile (Q_1) was selected as group I, 75% of the group with the index value above Q_1 and below Q_3 as group II and 25% above quartile three (Q_3) as group III. In the groups selected this way, the assessment of size and effectiveness of the used land and work resources was made in the period of 2004-2006. Every year different objects could belong to different groups; therefore based on the results generated this way one cannot make a conclusion related to changes of the examined features in certain units. For this reason the main focus was on the horizontal analysis and interrelations between groups in a certain year.

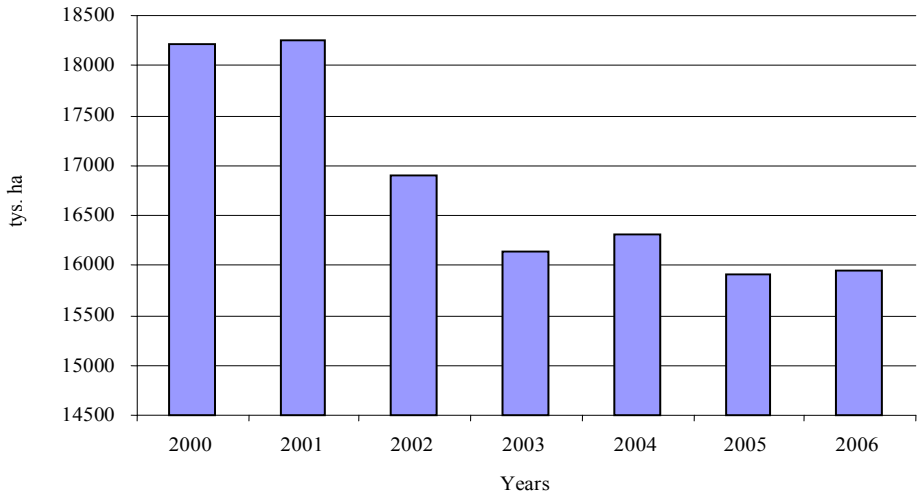
The study uses source materials of the community of Polish FADN, European Statistical System and own research run in the selected farms.

Land and workforce resources in Polish agriculture

Land resources constitute an important element to specify the production potential of agriculture. They constitute the physical basic of agricultural production, but land is also the seat of this production. The general volume of agricultural production is the product of the surface of land used for agricultural purposes and its unit effectiveness (Woś A., Tomczak F., 1979). Among the European Union countries, Poland is a leader possessing largest resources, even though in 2000 some marginal soils were excluded from use (Figure 1).

The examined farms were characterised by a relatively big area of arable land (Table 1). On average the surface was from 20,8 ha in 2004 to 23 ha in 2006. Along with the increase of relations with the environment, the surface of farms was growing every year.

It proves that farms with a bigger surface maintained more intense contacts with the



Source: Eurostat.

Figure 1. **Changes in land resources in Poland in the period of 2000-2006 [thousands of PLN/ha]**

Table 1

Surface of own and leased arable lands in the 2004-2006 period in the examined farmsteads

Farms from group	Surface of arable lands [ha] in the period			Surface leased [ha] in the period		
	2004	2005	2006	2004	2005	2006
I*	18.2	19.4	19.9	3.6	4.9	4.8
II**	21.9	22.6	22.9	4.8	5.8	5.7
III***	22.2	23.7	26.5	5.8	5.7	8.1

* group I - 25% of farms of the index value below the value of the first quartile (Q_1),
** group II - 75% of farms of the index value above Q_1 and below Q_3,
*** group III - 25% of farms above the third quartile.

Source: author's research

environment. One should also notice that in the years subject to the examination, there was an increase of the size of farms (including also leased arable land). In units with the smallest relations with the environment this increase was about by 9%, whereas in the largest by 19%.

Besides land resources workforce resources constitute a factor determining production capability of farmsteads. Among the European Union countries Poland has the largest number of people employed in agriculture (also per 100 ha of arable land). And even though employment in the agricultural sector in Poland has been decreasing (in 2003 it was 17%, and in 2007 – 15.6% of the total population), it is still a high index in comparison to the European Union countries (stat.gov.pl).

Workforce resources, measured in work units (fully employed people - *annual work units*) according to the normative time of work of 2200 hours/year in the examined farms are presented in Table 2.

With the increase of relations of farms with the environment work outlays, including hired work have been increasing. But the use of hired workforce in farms in Poland is insignificant. Only in farms of the highest index of relations with the environment those resources were about 0.4 AWU. It is related to the surplus of workforce in individual family farms in Poland.

Despite the surplus of workforce in individual agriculture there is a group of farms searching hired workers. Still shortages of workforce in individual agriculture have been a marginal phenomenon. In 2005 they occurred on average in 4% of farms, but in large farms (above 50 ha UR), the shortage of workforce occurred in 25% of units. Shortages of workforce in large farms are the result of the lack of a complex mechanisation of work. Permanent places of hired work created by individual agriculture, as well as seasonal ones for 1 - 2 months per year, do not substantially affect the labour market in Poland. The group of people required for work in agriculture has been constantly diminishing (www.cbr.edu.pl).

Land and work productivity

Productivity index in economy is settled as the relation of effects to the total outlays for human and objectified work. The notion of productivity is often exchanged for the notion of effectiveness.

For the purpose of the research, a measurement unit of the use of land was its productivity, expressed by the relation of agricultural production value per 1 ha UR. A more appropriate category to assess the effectiveness of land could be perhaps the plant production value, but on the account of the fact that the farm is assessed as one organic whole, we take the total number of products manufactured there for the purpose of the index.

Land effectiveness was determined with the use of agricultural production value per 1 ha of arable lands, in the period of 2004-2006 in farms of varied relations with the environment (Figure 2). Land productivity has been growing along with the increase of relations of farms with the environment. Definitely the largest land productivity was characteristic for farms from the group with the largest index of relations. One should also notice that the difference of land effectiveness between the first and the second group was about 20% in all the years, whereas between the second and third group the increase was 70% in 2006, in 2004 87%, and in 2005 it was almost 100%. In this case one could observe clear effect of farms' relations with the environment on land effectiveness. But even farms of the largest productivity in Poland do not match with the effectiveness obtained in countries such as the Netherlands or Belgium.

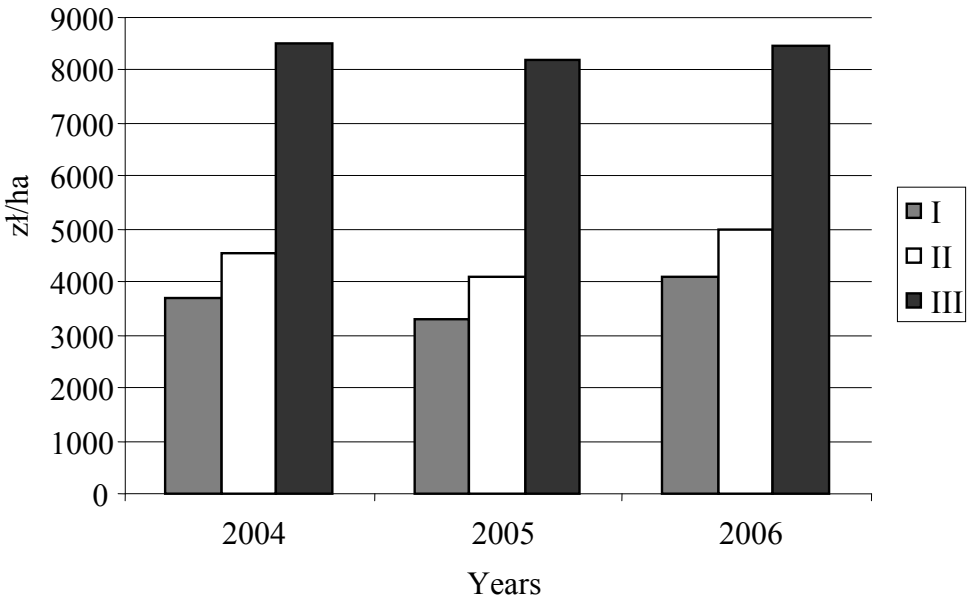
One of the mechanisms affecting the evolution of family economy in agriculture is the level of work effectiveness counted as gross value added per 1 employed. It is also an important index describing development processes in the economy of every country. According to the research, agricultural farms in Poland do not obtain the appropriate level of efficiency and productivity (even large companies) making it possible, for instance, to obtain parity income (Tomczak F., 2005). The increase of work efficiency leads to lowering costs, an increase of the supply of

Table 2

Workforce resources and work outlays in the farms of varied relations with the environment in the period of 2004-2006

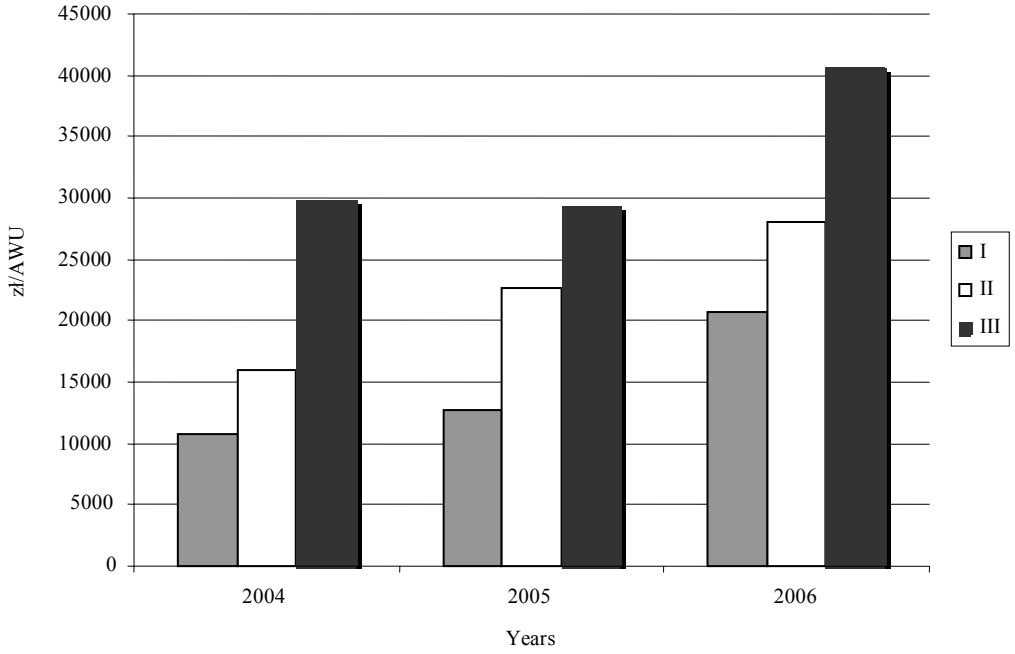
Farms from group	Total work outlays [AWU]			Including hired workforce outlays [AWU]		
	2004	2005	2006	2004	2005	2006
I	1.77	1.70	1.72	0.06	0.02	0.07
II	1.93	1.94	1.95	0.19	0.16	0.21
III	2.20	2.31	2.30	0.40	0.43	0.42

Source: author's research



Source: author's research

Figure 2. **Land productivity [PLN/ha] in the period of 2004-2006 in the farms with the largest market relations**



Source: author's research

Figure 3. **Work efficiency in the examined farms in the period of 2004-2006**

cheaper goods and services, market development and translates into an increase of purchasing power, which entails the level of wealth of societies (Gołaś Z., Kozera M., 2002).

In Poland one can observe a high level of employment in agriculture, or in fact a high level of workforce resources, which affects, among others, work efficiency. The obtained work efficiency values calculated as net value added per 1 employed in the examined farms are presented in Figure 3.

In the examined groups of farms every year of the examined three years a significant increase of efficiency was observed, depending on relations with the environment. Similarly like in case of land

productivity the largest differences in the increase of work efficiency occurred between the second and the third group of farms in 2004 and 2006. In 2005 the increase in the third group was a little lower.

Comparing work efficiency in Polish agriculture against the EU-15 countries, one can notice a substantial distance in its level. Even though in the period of 2000-2006 work efficiency in Poland increased, differences in relation to, e.g., Danish or Dutch agriculture were significant (in comparison to Denmark in 2007 Poland had almost 24-times lower efficiency and 17-times lower than the Netherlands) (Gołębiewska B., 2007).

Beside the high level of workforce resources in Poland, significant factors affecting the level of work author's research are also quality characteristics of workers. Of course such low work author's research means a terrible waste. But a change of this status could be affected only by moving a large number of workforce resources to non-agricultural resources. But this would require the creation of a suitable big number of work positions in Poland, which on the account of a significant unemployment is not possible at present.

Conclusions

The research run makes it possible to acknowledge that the family farms in Poland are very varied regarding contacts with the environment. The group of individual farms selected for the research, of varied relations with the environment proved that, both land resources, and workforce resources increased along with the increase of relations. Farms of stronger relations with the environment were more often interested in development and an increase of their surface.

The increase of relations with the environment positively affected the obtained efficiency. Both the use of land (productivity) and the workforce (work efficiency) was more beneficial in those farms, for which a bigger market activity was characteristic.

Thus one can ascertain that those farms which show market activity and more intense relations with the environment can function as commodity units. Farms which dispose appropriate production resources and which have managers open to the environment can attain this status.

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Concentration and Dispersion of Production as Risk Management Method, Opportunity or Threat in Agriculture

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Abstract
Cereal sowings accounting for half of the group of cultivated plants concentrate in agricultural commercial industrial enterprises of Latvia; and such tendency continues. The process of production concentration is well related to technological and technical modernisation reducing production risk and essentially increasing productivity and efficiency. Cereal productivity has a direct positive correlation with a corn-field area in the group of farms.
The sowings of wheat as the main cereal culture are concentrated in large commercial industrial agricultural enterprises with winter crops as the governing cereal culture there. The local (farm) use of cereals explains the almost equal location of barley sowings in small, medium and large farms.
The concentration of production directly correlates with the use of plant protection products that considerably reduce the risks of crop losses and economic losses.
Modernisation of production and professional quality promoted and affected by concentration relates to strategic risk management performed by managers of large agricultural enterprises.
Key words: agriculture, manufacture, concentration of risk, management.

Introduction
Several researchers (Špoģis, 2007; Siliņa, 2007, Radžele-Šulce, Švēdere, 2007) in Latvia have already studied strategic choice risks related to concentration of agricultural production in some sectors of crop farming and livestock husbandry; although the ongoing economic and political processes, economic polarisation of rural farms, differentiation of production units, activities of technically and technologically progressive enterprises, and co-existence of primitive self-subsistence small-scale farms may cause both risky opportunities and economic threats.

Therefore the problems, causes, motives, arguments, consequences, and results related to the fragmentation, dispersion or on contrary concentration of agricultural production entities or statistical units (farms, enterprises, companies) as well as processes might be studied from different aspects.

Political motives and aspects
Several different motives may form the policy of concentration or completely conversely the policy of dispersion of agricultural structures and agricultural production; however the processes in Latvia are also bound to the diversity and interests of political parties.

The most important interests are linked with the main target of every political party, i.e., to enter the Parliament of the Republic of Latvia. Thus a maximum multi-numbered electorate shall be established to achieve the set target. Consequently in case a party is willing to become likeable (to get votes) in the countryside, then logically it is interested in subjects – rural farms which might also qualify for protective instruments.

On contrary managers and specialists from industrial production enterprises and companies may unite in another party. It is understandable that the managerial staff of commercial agricultural production enterprises and companies is economically educated and understands that presently the achievement of high competitive results is possible only by means of high technologies, using high-power machinery and equipment. So the mentioned segment has a strong motivation in agricultural concentration and specialisation, and they vote for the party which members, potential deputies and ministers, could ensure economic thinking, competence and economic support for rational management.

Economic aspects
Only those managerial decisions may be economically motivated that create conditions or opportunities for at least one of the following results:
- rational use of resources;
- high labour efficiency achieved through the use of modern technologies;

- economically efficient productivity level of cultivated plants or domestic animals;
- production costs competitive in the world market.

Striving for the mentioned results requires a scientifically significant analysis of the impact of concentration or dispersion of production.

Social and other aspects

Concentration or fragmentation of production may also differently and significantly influence public development interests – density of population, employment, etc.

Therefore consideration of the situation has led to the research **hypothesis** - concentration of production and solidness of sowings in relation to specialisation create risk for economic opportunities; while dispersion and diversification minimise risks on the economic level of low management.

The following research **aim** is defined to verify the hypothesis: to analyse interconnections between the areas of cereal sowings and cereal productivity in farms of different size, and to assess risks instigated by the concentration of cereal production.

The following **research tasks** are directly subjected to the set aim:

1) to analyse tendencies and process of changes in cereal sowing areas in rural farms;
2) to study concentration processes of the main cereal sowings, and to assess risk situation caused by them;
3) to analyse managerial strategies of agricultural enterprises in the management of production concentration risks.

Materials and methods

The research is developed based on statistical data for the latest 7 years period or only the recent data, and articles or interviews with managers or owners of agricultural enterprises in periodicals.

Qualitative methods (discussions, interviews, evaluations, analysis and synthesis) as well as the analysis of dynamic rows, structural calculations and grouping are used to solve the set tasks. Some tables comprise only the data of the recent 2 years, since the Statistical department did not provide the necessary groupings previously.

Results and discussion

1. Concentration and dispersion of cereal sowings in the management of sectoral economic risks

In Latvia the agricultural sector consists both of larger and smaller, and even small farms. The productivity level achieved by these farms also differs. The indicators of cereal production sector characterising the farm structure are analysed to study the differences.

The distribution of sowing areas in the farms of different size characterise the concentration of cereal sowings (Table 1).

The calculations of Table 1 show that the strategy of small, medium and large farms in cultivation of grain differs; besides the differences are significant:

- on the whole small farms rather sharply reduce cereal sowings; although it may also show that some of these farms have ceased cereal growing;
- the process of cereal concentration intensifies in large enterprises where total sown area rapidly increases and already covers almost half of the total cereal sown area in Latvia;
- also the group of medium-scale farms try to develop grain production.

The ongoing processes of concentration do not increase risks in cultivation of grain, since large enterprises have ensured technical and intellectual bases for risk management, while small farms are

Table 1

Concentration of cereal sowings in Latvian rural farms in 2007 and 2008

Indicators	Units of measurement	2007	2008
In small farms	thou. ha	147.4	107.4
Share of the small farms area	%	28.8	20.6
In medium farms	thou. ha	145.4	160.4
Share of the medium farms area	%	28.4	30.7
In large farms	thou. ha	219.0	254.1
Share of the large farms area	%	42.8	48.7
All farms, total	**thou. ha**	511.8	521.9

Source: data of the Central Statistical Bureau

Table 2

Dispersion risks of cereal sowings (negative impact on their productivity)

Sown area of cereals, ha	Number of farms by group				Yield of cereals			
	2001	2005	2006	2007	2001	2005	2006	2007
Larger than 300 ha	131	238	266	293	2.57	3.42	2.99	3.70
200.1-300.0	119	178	173	163	2.27	3.16	2.51	3.29
150.1-200.0	97	155	160	177	2.19	3.12	2.36	2.94
100.1-150.0	243	266	279	319	2.28	2.60	2.23	2.88
50.0-100.0	713	661	803	901	2.03	2.70	2.05	2.61
5.1-50.0	11401	8611	9343	7622	1.85	2.30	1.78	2.31
1.1-5.0	24429	16139	17216	13700	1.74	2.04	1.47	2.05
Up to 1 ha	26950	16954	16337	13999	1.80	2.20	1.47	1.93
Total	**64083**	**43202**	**44577**	**37174**	**2.09**	**2.80**	**2.26**	**2.94**

Source: authors' calculations according to the data of the Central Statistical Bureau

those which are mainly subjected to meteorological and other natural risks.

The concentration processes of cereal sowings and their large impact on grain productivity is vividly shown in the data and stability calculations of Table 2.

The number of the largest farms cultivating grain consistently increases and has more than doubled in six years. Also the number of large farms cultivating grain with the sown area exceeding 100 ha increases significantly.

The analysis of the impact of concentration on the yield of sowings and yield stability markedly presents positive impact of these processes: yield in large farms is not only the highest, but also the most stable one. The average yield in the group of largest producers is almost twice higher than in the group of smallest sowings. The most important conclusion is that the risk factor of yield in small farms is almost twice higher than in large farms.

The fact that the number of small grain growing farms has twice decreased during the period analysed is a positive aspect from the point of economic interests in cultivation of grain and risk management. Also the number of small grain farms with cereal sowings not exceeding 50 ha sharply decreases.

During the period analysed the total number of farms having cereal sowings has annually declined by 4485 production units on average. Unfortunately the data and calculations of Table 2 do not disclose other very important indicators of consequences related to concentration.

Thus further analysis includes the correlation between the level of grain yield and sown areas.

The calculations show that many farms in Latvia annually harvest dramatically low grain yields even below 1 t ha^{-1}. The sown areas in these farms amount to ca. 4 ha on average; besides grain cultivation there is possible only on primitive conditions.

The number and share of farms falling into the group of very low and unprofitable yield level (1.1-2.0 t ha^{-1}) is the largest and thus proves the yield capacity.

The number of farms by a group of standard yield (over 5 t ha^{-1}) is still small; however the process of concentration is well disclosed, as the average sown area has tripled and reached 130 ha during the period analysed.

The average yield is much higher (4.01-5.0 t ha^{-1}) in the group of farms where sowing areas increase fast and have already exceeded 40 ha.

The data and calculations summarised in Table 4 markedly demonstrate strategic action of those Latvian farmers who have specialised in grain cultivation and cultivate principal grain crops – winter wheat and spring wheat.

Concentration of sowings in large agricultural enterprises using modern technologies and high-powered machinery demonstrates that cultivation of wheat grain becomes more industrialised.

High-powered technical basis in combination with modern technology ensure the possibility to sow wheat, to undertake phytosanitary sowing protection measures as well as to harvest grain in the right agrotechnical time. These factors have a decisive and essential role in risk management under the very variable weather conditions characteristic to Latvia.

Small farms lack technical possibilities to minimise production risks; therefore their action discontinuing cultivation of wheat may be considered as economically substantiated.

Medium-scale farms cultivate ¼ of total wheat sowings, yet their possibilities in risk management are lower both in technical and technological aspects.

Table 3

Dynamics of the number of farms and average area of cereal sowings by groups of farms with different yield level in Latvia in 2001, 2004 and 2007

Yield level by group, t ha^{-1}	Number of farms by group			Average area of cereal sowings by each group of farms, ha			Share of each group in the total number of farms cultivating grain, %		
	2001	*2004*	*2007*	*2001*	*2004*	*2007*	*2001*	*2004*	*2007*
Dramatically low, insignificant yield – up to 1.0 t ha^{-1}	11073	3356	4946	4.1	4.5	4.2	17.3	7.1	13.0
Very low, unprofitable yield between 1.1 and 2.0 t ha^{-1}	32514	1628	14329	5.7	5.7	8.1	50.7	44.3	37.6
Low yield between 2.1 and 3.0 t ha^{-1}	16396	18484	12497	8.8	8.5	12.7	25.6	39.3	32.8
Marginally profitable, standard yield between 3.01 and 4.0 t ha^{-1}	3284	6507	4287	14.7	15.1	27.9	5.1	13.8	11.2
Medium yield between 4.01 and 5.0 t ha^{-1}	769	1619	1764	20.3	27.6	41.8	1.2	3.4	4.7
Yield higher than 5.0 t ha^{-1}	47	516	251	46.3	50.5	129.7	0.1	1.1	0.7

Source: data of the Central Statistical Bureau and authors' calculations

Table 4

Risks of sowing concentration of the principal grain crops – winter wheat and spring wheat – in Latvian rural farms in 2006 and 2007

Indicators	Units of measurement	2006	2007
In small farms			
Winter wheat	thou. ha	22.6	18.8
Spring wheat	thou. ha	13.1	9.0
Wheat total	**thou. ha**	**35.7**	**27.8**
Share of winter wheat	%	63.3	67.6
Share of small farms	%	16.6	12.4
In medium-scale farms			
Winter wheat	thou. ha	38.6	38.9
Spring wheat	thou. ha	16.8	17.6
Wheat total	**thou. ha**	**55.4**	**56.5**
Share of winter wheat	%	69.7	68.8
Share of medium-scale farms	%	25.8	25.2
In large farms			
Winter wheat	thou. ha	91.1	101.7
Spring wheat	thou. ha	32.9	38.6
Wheat total	**thou. ha**	**124.0**	**140.3**
Share of winter wheat	%	73.5	72.5
Share of large farms	%	57.6	62.5
In all farms			
Winter wheat	thou. ha	152.6	159.4
Spring wheat	thou. ha	62.8	65.2
Wheat total	**thou. ha**	**215.1**	**224.6**

Source: data of the Central Statistical Bureau and authors' calculations

Table 5

Concentration of spring barley sowings in Latvian rural farms in 2007 and 2008

Indicators	Units of measurement	2007	2008
In small farms	thou. ha	50.8	36.5
Share of small farms area	%	33.9	26.1
In medium-scale farms	thou. ha	47.0	49.9
Share of medium-scale farms area	%	31.4	35.7
In large farms	thou. ha	52.0	53.3
Share of large farms area	%	34.7	38.2
In all farms, total	**thou. ha**	**149.8**	**139.7**

Source: authors' calculations according to the data of the Central Statistical Bureau

Table 6

Use of plant protection products (PPP) in farms (enterprises, companies) in 2001 in Latvia

Farm size – total sown area, ha	Used effective substances of PPP, kg/ha	Base growth rate for the used amount of PPP, %	Yield obtained from principal field crops, t ha^{-1}		
			grain	potatoes	rape
Micro, up to 10.0	0.29	100.00	2.01	12.20	1.01
Small, 10.1-50.0	0.62	217.20	2.28	15.30	1.31
Medium-scale, 50.1-100.00	0.91	313.80	2.51	18.10	1.63
Larger, 100.1-500.0	1.09	375.90	3.00	20.01	1.91
Large, more than 500 ha	1.54	531.10	3.52	22.81	2.11

Source: data of the Central Statistical Bureau and authors' calculations

Agronomists know that under the weather conditions of Latvia winter wheat provides opportunities to obtain considerably higher yield compared with spring wheat, thus the action of managers of large enterprises and also owners of smaller farms maximally concentrating on cultivation of winter wheat where the share of sowings already reaches ¾ of total wheat sowings, is very logical.

The following tendencies may also be assessed as economically adequate: total area of wheat sowings in large agricultural enterprises has annually increased by 13%, the growth in medium-scale farms is insignificant, while the total area has decreased by 22% in small farms.

The distribution of barley sowing areas differ (Table 5).

The first common difference in farmers' action is that winter barley is considered as a risky crop and the share of barley sowings is small; yet all calculations and assessments relate only to spring barley.

The other difference as shown in Table 5 may be related to the aims of barley cultivation in different size farms. In small farms barley is grown for chicken and pig feed as well as for malt to produce home brewed beer, while in medium-scale farms barley is mainly used for fodder. The aims for cultivation of barley in large enterprises differ; though the main aim is fodder production for specialised sectors as well as for beer production in various specialised farms.

Plant protection against diseases of cultivated plants, vermin and weeds play an extremely important role in risk management of crop farming. Although this thesis has to be defended by the use of concrete official statistical data that are summarised in Table 6.

The following undeniable conclusions may be drawn based on the data of Table 6:

- micro farms fairly rare use the mentioned risk management instrument or means in crop farming, and it might be one of the main reasons for low yield in the group of these farms;
- small farms with the total sowing area ranging between 10.1 and 50 ha have used twice more plant protection products and have harvested grain yield by 20-30% higher;

- medium-scale farms have used by 1/3 more plant protection products and have obtained considerably bigger harvests;
- large farms having used 5 times more pesticides have harvested almost twice more grain and potatoes, and especially high harvest of rapeseed.

2. Strategic opinions of managers of agricultural enterprises on management of production concentration risks

The farmer with a large farm "Tēraudiņi" (1350 ha of agricultural land) located in Pierīga region considers strategic adaptation of production to uncontrollable risks or risks that are subjected to a minimum influence and created by local natural and soil conditions as well as industrial environment as important risk management factors in an agricultural enterprise.

Therefore he concentrates on cultivation of grain where rye is the governing crop, and consequently he harvests grain amounting to 5-6 t ha^{-1}. Smaller areas are planned for barley and oats, while wheat is not cultivated in the farm.

Potatoes are another specialised crop grown in the farm "Tēraudiņi". The closeness of Aloja starch mill has promoted the growth of potatoes.

The establishment of contractual relations with collaboration partners thus significantly reducing or excluding risk of price fluctuations during the year is another risk management principle. Contracts are concluded on sales of grain, and supply of mineral fertilisers and plant protection products.

The development of auxiliary sectors thus solving two problems: employment of people in the period of demi-seasons and equalisation of income flow is the third principle.

Juris Laivenieks, the farm "Valneri" (2008) operating in Zemgale region, has a specific concept in agricultural risk management.

The farmer manages risks cultivating only winter crops – winter wheat (400 ha) and winter rape (200 ha), since he considers spring crops to be less productive and more risky, i.e., crops that are more subjected to the impact of weather conditions.

Another risk management method performed by the farmer is storing of threshed yield till spring, when the price of grain might become higher. Thus the farmer subjects all the capital invested into the yield to the opportunity risk for many months, and hence does not allow money to generate profit. In case risk of opportunity risk expectations for higher price turn to be not a good risk, then the farmer may incur big losses.

The mentioned risk management measures also require investment of financial resources into the building and maintenance of grain storage house, and so financial resources are excluded from turnover.

Under the conditions of a globalised market, prices for grain main fluctuate in different directions and at different rate, and the farmer's expectations for a higher price in spring may go wrong.

Excluding of straw from agro-biological circulation in the farm, and incineration of straw in straw blocks is the third risk management peculiarity performed by the farmer. In a long-term the farmer should evaluate whether the use or sales of straw for processing into heat energy would compensate the reduction of the content of organic substances in the soil.

Besides to save money for the purchase of mineral fertilisers the farmer buys poultry manure from the JSC "Balticovo", thus also investing capital into special equipment for transportation, granulation and dissipation of poultry manure.

Andris Ķikurs, the manager of the farm "Dzenīši" located in Code, bases his risk management strategy on the knowledge in economics and agronomy. After the assessment of risks of losses caused by possible giving up classical rotation of crops and agronomic interests and benefits provided by specialisation and concentration, the mentioned farmer from Zemgale region has given up cattle-breeding and has specialised in cultivation of two crops – winter and spring wheat, and spring rape.

The farmer A. Ķikurs has given up risks related to saving money on the use of less plant protection products. Such decision was made after hard yield losses from rape sowings.

A. Ķikurs sells the obtained yield of wheat and rape seeds to the cooperative society "Saimnieks V" for further pre-treatment and sales to enhance cash turnover. For the purpose of management of resource price risks the farmer buys mineral fertilisers and plant protection products from the cooperative already in winter.

Alvils Grickevics (2008) manages 360 ha of land, and harvests 6-7 t ha^{-1} of wheat and 3-4 t ha^{-1} of rape seed. The farmer has included the following aspects into the management strategy of management risks:

1) specialisation and concentration of production, liquidating many sectors previously applied in practice and concentrating on cultivation of wheat and rape;
2) winter crops – wheat and rape – as governing crops;
3) application of complete technology in cultivation of wheat and rape, consequently ensuring full

fertilisation to the expected yield thus essentially reducing the share of costs for fertilisers and plant protection products in the value of harvested yield;
4) complete technical provision for the performance of the works in the right time.

Ivars Geiba, the farmer of the farm "Kurmīši" located in Latgale region, in his specialised (production of vulnerary teas) farm considers the following aspects as the manager's priority in risk management:
1) technological modernisation;
2) controllability of all production processes;
3) high and stable quality of labour, processes and results.

Andris Miglavs, a doctor of economics, (2008) has provided extensive economic studies in the context of risk management in dairy production sector. He has summarised his research results in the following conclusion: "The only real possibility for our dairy sector to continue operation is to become more efficient in the future. ... simply there is no other possibility. Cheaper production of good milk, cheaper transportation to a processing company, cheaper processing of milk into a more expensive product demanded by a customer and selling having least production costs. In case somebody is not ready to follow this way, there is no need to invest into the development of production, and it is better to look for another type of economic management".

We can only agree to such assessment expressed by A. Miglavs, since it coincides with our evaluations resulting from the economic analysis of the sector.

Ilmārs Immurs (2008), the manager of Vidzeme potato growers' society and the farm "Jaunozoli", has interesting judgments on risks experienced by potato growers and problems managing these risks. First, he has rightly concluded that potato processing companies now accept only potatoes of a very good quality. Therefore many potato growers have liquidated this sector.

Also the statistical data confirm the problems experienced by the farmers of Vidzeme:
- consumption of potatoes per inhabitant consistently and essentially decreases in Latvia, Estonia, and Lithuania similar as it is in other European countries;
- the use of potatoes in processing industry also declines;
- consumption of potatoes for feed-stuff has completely decreased, as potatoes are economically inconvenient due to the large content of water;
- areas of potato plantings decrease, as subsistence farms are the main potato growers and consumers.

Pēteris and Jolanta Knope, the owners of the farm "Rudeņi" located in Zemgale region, have determined the following risk management strategy in the management of their farm, the size of which equals to 537 ha:
- modernisation of dairy farm to change labour productivity radically;
- highly productive herd, high productivity of milkers – 8-10 tons of milk per cow;
- professionally programmed feeding of cows;
- discontinuation of cow feeding in pastures where cows damage legs and lose production.

Ilze Aizsilniece (2008), the chairperson of the board of Latvian Producers Cooperative Association, considers that the processes of concentration in dairy sector may become active, as lately the number of owners of milk sales quotas is rapidly decreasing.

Gatis Zonenbergs (2008), the owner and manager of the agricultural enterprise - the farm "Jaunkalni", is worried about the risks of a manager and management in another aspect. He considers the consolidation of land properties and areas under the use as problems that are difficult to solve, since the production located in large distances (up to 40 km) is much more subjected to management risks and significantly weighs down risk management.

Gatis Zonenbergs also considers optimisation of the areas under the management for the rational use of modern technique as a condition for a rational management. The fact that foreigners – Germans, Danes and other – intensively buy land in Kurzeme hinder the expansion of the current areas under the management (600 ha).

Conclusions

1. The research results validate the defined hypothesis that concentration of cereal sowings in large enterprises and solidness of cereal sowings create risks for economic opportunities where a targeted and perfect management guarantees higher productivity and efficiency, while the dispersion together with diversification minimise risks; although on low economic management level.
2. Cereal sowings consistently concentrate in large agricultural enterprises where opportunity risks for higher yields are well performed.
3. The actual sowing areas rapidly increase in enterprises with higher yield of cereals.
4. Low or dramatically low yields observed in micro and small farms might be considered as economic consequences of production dispersion.

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Социально-экономические и экологические проблемы субтропического хозяйства Грузии
Socio-Economic and Ecological Problems of Georgian Subtropical Agriculture

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Abstract.
The article deals with the analysis of the current issues in Georgian agro-industrial sector. Arable territories were separated during the reorganisation process of the Soviet collective farms. Newly established small – the so-called ”Countrymen Unities” are not effective due to inadequate material-technical base; agricultural productivity is reduced as implemented through primitive and old insensitive technologies. The gained production is not competitive, and accordingly, the productivity of agricultural branches such as tea-breeding, citrus, laurel, oil plantings and technical cultures have become unprofitable.
The main drawbacks of subtropical agriculture are represented in the article, namely: irrational use of arable territories, inefficient credits, insufficient material-technical base, unstable agrarian market - ignoring priority directions, worsening ecological problems and so on.
The most urgent activities to be undertaken to maintain radical activities, to well define the agrarian policy, to implement highly-intensive technologies of industry, and to develop such priority branches as: agro-tourism and eco-tourism. All these aspects demand the creation of effective business plan, maintaining agrarian countries' experience, and scientific approaches in the industry, thus fostering agricultural development and economic growth of the country itself.
Key words: sub-tropics, tea-breeding, citrus breeding, ecology, rehabilitation.
Ключевые слова: Субтропики, чаеводство, цитрусоводство, экология, реабилитация

В реальных условиях сегодняшней Грузии, когда страна залечивает тяжелые раны воины, особенно обострились социально-экономические и экологические проблемы. Это касается как всего сельского хозяйства, так и его специфической отрасли субтропического хозяйства.

Субтропическое хозяйство в Грузии относительно новая отрасль, хотя некоторые культуры субтропической флоры: грецкий орех, фундук, инжир, гранат, каштан, лавр, самшит и др. представлены здесь с незапамятных времен, о чем свидетельствует большое разнообразие их дикорастущих форм. Тоже самое можно сказать и о таких значительных представителях местной флоры, какими являются цитрусовые (померанцевые), культура которых в отличие от вышеупомянутых растений является сравнительно новой, хотя на черноморском побережье Грузии история их возделывания насчитывает более 400 лет.

Сравнительно недавнюю историю развития в субтропических регионах Грузии имеет чайное растение. Его завезли из Никитского ботанического сада (Ялта) в Озургетский акклиматизационный питомник в 40-их годах XIX – века и достаточно длительное время население ближайших районов разводило его только для удовлетворения своих потребностей.

Несмотря на то, что в богатой флоре Грузии издавна были представлены разные представители субтропических растений, в течение многих десятилетий не было налажено товарное производство продукции многих субтропических культур, как например: чая, цитрусовых, восточной хурмы, фейхоа, бамбуков, лавра благородного, эвкалипта, других древесных и травянистых эфиромасличных растений и д.р.

Для субтропического хозяйства XX век примечателен ростом площадей промышленных плантаций субтропических растений и увеличением производства их товарной продукции. Это стало возможным благодаря кропотливой плодотворной работе ученых и практиков-новаторов, энтузиастов

субтропического хозяйства. В разработке научных основ субтропического хозяйства наряду с другими научно-исследовательскими и учебными учреждениями весомый вклад внес Грузинский государственный университет субтропического хозяйства, который после известных абхазских событий ныне функционирует в г. Кутаиси.

Переход на рыночные отношения, как для всего сельского хозяйства Грузии, так и для субтропического хозяйства не прошел безболезненно. Несмотря на то, что при проведении аграрной реформы Грузия занимает одно из первых мест среди постсоветских республик по передаче земли в частную собственность, (что безусловно является весьма позитивным явлением), в процессе реорганизации бывших совхозов и колхозов были допущены серьезные ошибки, которые оказали негативное воздействие на производство сельскохозяйственной продукции и, особенно, продукции субтропического растениеводства. Вместо сохранения в целости тех плантаций чая, цитрусовых и других субтропических культур, где основные рабочие процессы были механизированы и создания акционерных обществ, эти плантации были раздроблены на мелкие участки и переданы во владение крестьянам, обществам с ограниченной ответственностью, мелким кооперативам и т. д. Вследствие этих и других факторов площади субтропических растений в стране резко сократились. Так например, площадь чайных плантаций с 65 тыс. га в 1985 году, сократилась до 35 тыс. га. в 2007 г. Из них в эксплуатации находится не более 13 тыс. га. Остальная часть из-за неухоженности остается неиспользованной. Поэтому неудивительно, что в 2007 году было собрано лишь 7,5 тыс.тонн чайного листа, (этот показатель в 1986 году составлял 501,7 тыс. тонн). Значительно сократилось производство цитрусовых, так например: в 1990 году было произведено 283,1 тыс. тонн цитрусовых плодов, а в 2007 году только 98,9 тыс.т. Площадь цитрусовых насаждений с 25,1 тыс. га в 1990 году, сократилась до 7,7 тыс. га в 2007 году.

В отличие от чая, цитрусовые насаждения в значительной степени были сосредоточены на приусадебных участках и удельный вес индивидуального сектора всегда был весомым в общем производстве цитрусовых.

Что касается чая, его возделывали в основном специализированные чайные совхозы и колхозы, и чаеводство субтропических районов Западной Грузии было одним из ведущих и рентабельных отраслей, что в значительной степени обусловливал нормальный уровень жизни сельского населения. Качеством грузинского чая потребители были довольны. Но после 70-их годов, когда руководство бывшего Советского Союза решило обеспечить потребность огромного государства в чае местного производства, в Грузии (где производилось 98% этой продукции) стали на практике внедрять т.н. “жесткий сбор”, что стало началом деградации этой отрасли. Неоправданное увеличение планов производства чая, вызвало ухудшение механического состава собираемой массы листа. Наряду с молодыми побегами собирали одревесневшие стебли и грубые листья, удельный вес которых в общей массе составлял 90-95%. Это стало причиной резкого ухудшения качества сырья и готовой продукции и потери доверия потребителей, как на внутреннем рынке, так и зарубежом.

Восстановление и дальнейшее развитие чаеводства должно стать приоритетным для нашей страны и для этого у нас имеются все условия. Чай весьма дорогостоящий продукт и может принести государству большие доходы. Но для этого необходимо, чтобы производилась конкурентоспособная продукция. Те немногие фермерские хозяйства, которые хорошо усвоили эту азбучную истину рыночной экономики производят высококачественную продукцию черного и зеленого байхового чая. Некоторые из них предпочитают реализовывать зарубежом полуфабрикаты, которые затем реализуются в расфасованном виде в различных странах, однако ни как грузинская продукция. Это лишний раз доказывает, что и у нас умеют производить конкурентоспособную продукцию, когда предпочтение отдают качественным показателям, а не количеству.

То обстоятельство, что климатические условия субтропической зоны Грузии более суровые, чем в других странах (например, в Индии, в Китае и т. д.) имеет свои положительные стороны, что, в частности, отражается на качестве продукции и ее экологической чистоте. Дело в том, что в наших условиях чай и некоторые субтропические культуры не нуждаются в применении ядохимикатов против болезней и вредителей, т.к. зимой эту обязанность прекрасно выполняют снег и морозы. Поэтому грузинская продукция, в отличие от продукции других стран, является экологически чистой и не содержит ядовитые вещества.

Для реабилитации чаеводства потребуется действенная помощь со стороны государства, фермерским хозяйствам, которые испытывают хронический дефицит как в средствах малой механизации, так и в оборотных средствах. Следует также ускорить предоставление им целевых льготных кредитов.

Реабилитация чаеводства отнюдь не означает эксплуатацию чайных плантаций в объеме советского периода. В этом нет никакой необходимости, по нашим расчетам площади эксплуатируемых чайных плантаций не должны превышать 40 тыс. га. На этой площади, с учетом внедрения интенсивных технологий и при средней урожайности 5 т. с 1 га, можно получить 200 тыс.т. высококачественного сырья, для переработки которого следует модернизировать существующие фабрики и построить несколько новых современных чаеразвесочных фабрик.

Возрождение этой отрасли, наряду с другими положительными сторонами будет существенно способствовать улучшению социально-экономического положения сельского населения Западной Грузии.

Второй основной отраслью субтропического сельского хозяйства является цитрусоводство. Производство ее продукции в основном сосредоточено в Аджарской А.Р., где 2007 году получено 80,5 тыс.т. плодов (81,3% всего их производства).

В отличие от чая, реабилитация цитрусовых насаждений проходит более успешно и это обусловлено тем обстоятельством, что большое количество указанных насаждений, как отмечалось выше, расположены на приусадебных участках крестьян. В настоящее время продукция цитрусоводства экспортируется на Украину, в Белоруссию, в Армению и в другие страны. Нашими цитрусовыми серьезно заинтересовались и государства Евросоюза, на рынках которых с будущего года предусмотрены их поставки.

Сейчас в мире ощущается большая потребность в экологически чистых сельскохозяйственных продуктах, что является хорошей предпосылкой для увеличения экспорта нашей продукции.

Эмбарго России на ввоз грузинских товаров, как ни парадоксально, сыграло положительную роль в деле улучшения качества продукции и поиске новых рынков, а также дало стимул развитию перерабатывающей промышленности, в том числе и по переработке продукции других субтропических культур.

Мы считаем, что увеличению производства товарной продукции субтропических культур существенно будет способствовать государственная программа дальнейшего развития этой отрасли, в разработке которой активное участие принимает наш университет. На наш взгляд, больше внимание следует уделить интеграции фермерских хозяйств в специализированные кооперативы и ассоциации, налаживанию их прямых связей с потребителями, а также вопросам рационального использования уникальных природно-климатических условий субтропической зоны Западной Грузии, разработке новых подходов и более бережного отношения к окружающей среде. К сожалению, пока еще имеется немало взаимоисключающих случаев, вызывающих эрозийные процессы и оползни, вследствие чего определенное количество уникальных земельных угодий выходят из сельскохозяйственного оборота, и к тому же создается опасность для жизни и здоровья людей. Серьезно надо заняться берегоукреплением черноморского побережья, особенно в окрестностях Батуми, где разбушевавшаяся стихия почти ежегодно поглощает в морской пучине ухоженные цитрусовые плантации.

Субтропические районы Грузии (и не только они) являются прекрасным местом отдыха, однако в нынешних условиях мы должны временно отказаться от возрождения массового туризма, чтобы не нанести непоправимый ущерб окружающей среде и отдать предпочтение семейному туризму, ориентированного на Западный рынок. Это безусловно сыграет положительную роль в укреплении экономики всей страны, и станет существенным подспорьем для фермерских хозяйств этих регионов.

Выводы и предложения

1. Субтропическое сельское хозяйство Грузии наиболее новая отрасль сельского хозяйства, производство товарной продукции которой в недавнем прошлом в основном было сосредоточено в совхозах и колхозах и обусловливало их высокую рентабельность. В процессе реорганизации бывших совхозов и колхозов были допущены серьезные ошибки, оказавшие негативное воздействие на производство продукции субтропического растениеводства.
2. Реабилитации плантации чая, цитрусовых и других субтропических культур на наш взгляд следует осуществлять с учетом требований рыночной экономики, на основе научно-обоснованной государственной программы, в разработке которой активное участие принимает Грузинский государственный университет субтропического хозяйства.
3. Увеличение объёма производства чая, цитрусовых и других субтропических культур и улучшение их качественных показателей, являются необходимым условием дальнейшего развития этой отрасли и должно происходить внедрением интенсивных технологии с учетом растущей потребности внутреннего и внешнего рынка в экологически чистой продукции.
4. Основной проблемой субтропической зоны Грузии, является защита окружающей среды и сохранение экологического равновесия. Поэтому необходимо постоянное совершенствование региональных экологических проектов как для горных районов, так и для Черноморского побережья.

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Сельское хозяйство Грузии в условиях рыночной экономики
Georgian Agriculture on Market Economic Conditions

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Abstract
On the background of the world global financial crisis humans face food crisis problem as well. The main concept of the represented article is to highlight the ways for solving crisis. Each country shall select the optimal variant scope of adaptability in the world market sphere.
It is known that resolving food crisis will be affectively achieved through growing and using arable territories.
We consider that both ways will be well approached, though the priority ought to be given to the second direction which implies the establishment of highly-intensive technologies, industrial specialisation and cooperation, also the use of modern energy saving techniques and perfection of social infrastructure and so on.
Therefore we consider that individuals employed in agro-industrial sphere, especially in agriculture ought to be well-qualified, the main attention shall be directed to qualifying the highly-qualified specialists and implementing the modern system of vocation.
On market economic conditions the aim of the science is the perfection of correlation of food products, product gain, marketing and management completion, also the definition of short and permanent period results and adequate activities on agrarian sphere in the noted processes. All the above mentioned factors will foster the effective use of agro-technical, zoo-technical and biological potential in Georgian agriculture.
Key words: tea-breeding, citrus breeding, laurel breeding, sub-tropics.
Ключевые слова: Чаеводство, цитрусоводство, лавроводство, субтропик.

На примере Грузии рассмотрены некоторые вопросы развития регионального сельского хозяйства в условиях рыночной экономики.

Сельское хозяйство рассматривается в составе единой системы АПК в качестве основы обеспечения продовольственной безопасности как в любой отдельно взятой стране, так и в мире в целом.

Сельское хозяйство современной Грузии - наследница исторически сложившихся традиций и специализаций, является частью мировой аграрной системы.

Известно, что экономика страны, ее хозяйственный быт формируются в той природно-экономической, исторической среде, которая характерна и своеобразна для данной страны. Наряду с этим, в цивилизованном мире идет процесс глобализации, что обусловливает потребности в информации, а это существенно как для экономики страны в целом, так и для адаптации аграрной экономики в системе рыночных отношений. В этих условиях особенно ценны знание, опыт и предпринимательские способности человека. Все это делает эффективным использование ресурсов производства, в том числе людских ресурсов.

На направление развития сельского хозяйства Грузии определенное влияние оказал период пребывания в составе бывшего Союза, когда сельское хозяйство было ориентированно в основном на так называемые отрасли союзного значения**:** чаеводство, цитрусоводство, (см. таблицу) лавроводство, табаководство, производство продукции других субтропических плодовых и технических культур. Следует отметить, что в указанных и других отраслях рынок в то время развивался в закрытой форме, а такой компонент как рыночная цена формировался вне всякой конкуренции и, что самое главное, без учета закона спроса и предложения, т. е. путем администрирования, В следствие, чего на этом этапе, рынок резко сократился.

Таблица

Урожай цитрусовых и чая в Грузии по категориям хозяйств

Годы	Цитрусовые			Чай		
	Валовой урожай всего тыс.т	Доля семейн. хозяйств (%)	Доля сельхоз. предприятий (%)	Валовой урожай всего тыс.т	Доля семейн. хозяйств (%)	Доля сельхоз. предприятий (%)
1985	134,6	76,7	23,3	581,2	7,3	92,7
1990	283,1	83,5	16,5	501,7	7,2	92,8
2000	40,1	98,5	1,5	24,0	33,7	66,3
2001	60,0	98,8	1,2	23,0	93,5	6,5
2002	33,1	100,0	-	24,0	74,6	25,4
2003	59,2	100,0	-	25,5	75,7	24,3
2004	38,2	100,0	-	20,0	64,0	36,0
2005	122,4	100,0	-	22,8	86,8	13,2
2006	52,2	100,0	-	6,6	88,2	31,8
2007	98,9	100,0	-	7,5	73,3	26,7

" Сельское хозяйство Грузии," статист. сборник, Тб. 2007г.

В настоящее время в порядке дня встал вопрос ориентации Грузии на европейский и вообще Западный рынок.

В условиях получения Грузией статуса независимости перед ней встала задача нового решения экономических и социальных проблем. Среди них по-новому проявились необходимость разработки определения эффективности аграрной политики и проблем продовольственной безопасности страны, что предусматривает доступность продовольственной продукции для населения страны (с точки зрения покупательной способности), и ее безопасность для здоровья людей. В свою очередь, возник вопрос трудоустройства, рабочей силы и повышения уровня воспроизводства. Следует учитывать и то обстоятельство, что страна должна занять свои собственные позиции в процессе международной интеграции и глобализации. Проблему существенно осложняют начавшаяся с 2006 года агфляция и глобальный продовольственный кризис. Единственным путем преодоления дефицита продовольственных продуктов эксперты считают резкий рост объема производства.

Ясно, что глобализация не исключает сохранения в стране исторически сформировавшихся традиций. Парадокс глобализации в том, что особенно важным является именно национальное, традиционное развитие местной базы ресурсов (особенно людских).

С целью решения задач, стоящих перед Грузией, Министерством сельского хозяйства и продовольствия, научно-исследовательскими институтами и другими квалифицированными специалистами разработана концепция перспективного развития аграрной экономики страны, в соответствии с которой с учетом особенностей существующего в стране макро- и микро- экономического процесса, проведена работа по реформированию аграрной сферы, в частности по совершенствованию законодательной базы с целью овладения новыми рынками и росту их объема, прежде всего за счет сокращения импорта продовольственных товаров и увеличения экспорта в отношении балансирования потребности – доставки продовольствия. Значительные мероприятия осуществляются по утверждению в аграрной сфере нового мышления, эффективного менеджмента и маркетинговых исследований.

В вузах сельскохозяйственного профиля, в том числе в Грузинском государственном университете субтропического хозяйства, ведутся определенные работы по совершенствованию учебных планов и обучению новым дисциплинам, использованию компьютерной техники. В частности, признан приоритетным подбор эффективных форм современного инженерно-технического, технологического, материально-технического и интеллектуального обслуживания крестьянского, фермерского и других типов сельскохозяйственных предприятии,

формирование на селе производственной и социальной инфраструктуры на основе кооперирования.

В проблемах университета отражены работы по совершенствованию методологических основ агротехнологического, экономико-организационного характера для отраслей сельского хозяйства субтропической зоны страны. Проводятся исследования по разработке рекомендаций по внедрению новых культур и сортов в отличающихся природно-климатических условиях и географо-хозяйственных зонах (горной, предгорной и равнинной) внутри страны. Определенные работы проводятся по исследованию антропогенных ландшафтов и рекреационных ресурсов субтропической зоны, с целью обеспечения развития в стране экотуристической индустрии. Значительные работы ведутся по повышению экономического и социального уровня жизни населения горных районов Грузии во избежание массовой миграции людей в низменные регионы. Разработана поэтапная программа освоения рекреационных ресурсов Западной Грузии, в частности, Абхазии, с учетом соответствующих социально-экономических и экологической программ. По указанным программам на первом этапе предусмотрено создание курортов специализированного климатического характера. Таким образом, на первом этапе будет установлена связь хозяйственной деятельности с туризмом, в результате чего будут заложены основы для развития этой отрасли. Второй этап содержит развитие новых видов рекреационного действа, таких как**:** альпинизм и спортивный туризм, предусматривающие формирование транспортной и специализированной туристической инфраструктуры. На третьем этапе предусмотрено развитие зимних видов отдыха, в том числе создание горно-лыжного комплекса и др.

Зимний туризм уравняется с темпами летнего туризма и, таким образом, туризм станет успешной отраслью горной Грузии, параллельно быстро будут развиты другие виды хозяйственных и социальных отраслей.

В текущем, XXI веке на фоне характерной для мира глобализации, Грузия в основном, сохранит в соответствии с историческими традициями, сложившуюся аграрную специализацию, вновь останутся приоритетными промышленное направление виноградарства-виноделия, плодоводства, а также новые отрасли - чаеводство, цитрусоводство, лавроводство.

Указанными отраслями Грузия внесет свой определенный вклад в дело решения мировой аграрной проблемы. В соответствии с требованиями рыночной экономики значительное внимание будет уделено увеличению производства зерновых, овощных , кормовых культур для животноводства, на основе интенсификации этих отраслей. С целью балансирования спроса - предложения рынка, разрабатываются программы отраслей и культур, адаптированных к местным природно-климатическим условиям, в том числе для развития отраслей плодово-ягодных, фундука, некоторых других субтропических культур, пчеловодства и т.д.

В условиях рыночной экономики на сельскохозяйственных предприятиях в порядке дня ставятся вопросы необходимости производства продуктов глубокой технологической переработки.

Практика подтверждает что для страны намного выгоднее торговать винами из уникальных сортов винограда, соками плодово-ягодных, цитрусовых, томат-пастой продуктами животноводства, нежели продавать их в виде сырья.

Следовательно, проводится работа в направлении совершенствования производственной и социальной инфраструктуры на основе оптимальных масштабов кооперирования фермерских и других типов сельскохозяйственных производств, с тем, чтобы осуществлять аграрное производство по принципу: производство и переработка сырья, хранение – доставка до потребителя и продажа. Установившаяся структура сельскохозяйственной отрасли требует корректив и определения в новом направлении в соответствии с изменениями потребности потребителя.

В Грузии, в недавнем прошлом, приоритетное развитие т.н. союзных отраслей существенно ослабили внимание к производству продовольственного зерна и продукции животноводства. По статистическим данным уровень самообеспечения Грузии зерном не удовлетворяет потребности наполовину, также в пределах 70-75% колеблятся показатели самообеспечения продуктами животноводства. Показатели импорта сельскохозяйственной продукции значительно превзошли показатели экспорта.

Таким образом, в порядке дня в стране стоят вопросы уточнения ареала размещения сельскохозяйственных культур, определение перспективы развития традиционных и новых культур, повышение уровня интенсификации производства продовольственных культур. При широком применении программирования урожайности с использованием орошаемой

мелиорации необходимо по-этапно подготовить условия для развития т.н. биологического земледелия и, следовательно, сокращения применения химических удобрений и препаратов, что так важно для получения экологически чистой продукции. Такой подход оправдан и тем, что Грузия малоземельная страна. Достаточно отметить, что в пересчете на душу населения приходится всего лишь 0,17 га на пашни. Значительная часть сельскохозяйственных угодий расположена в горной и высокогорной зонах, представляя собой малоурожайные пастбища.

Известно, что на специализацию сельского хозяйства помимо природных факторов оказывают влияние рыночные отношения, что обусловлено необходимостью обеспечения балансирования спроса-предложения и доставки. В свою очередь этот процесс обеспечивает импульс потребности и способствует созданию инвестиционной среды. Рыночные отношения, в основном отражены в цене, объеме рынка и в другом виде, что свою очередь способствует созданию конкурентной среды, изменению структуры расходов и соответственно повышению показателей эффективности производства.

Выводы и предложения:

1. На основе многофакторного анализа и маркетинговых исследований следует продолжить работу в направлении формирования оптимальной связи сельскохозяйственных отраслей определения их оптимальных масштабов и организационных форм сельскохозяйственного производства и, в первую очередь, среди них крестьянских и фермерских хозяйств.
2. Формирование агробизнеса в стране следует осуществлять в направлении эффективного использования ресурсов социального благосостояния людей, экологической стабильности, природных, финансово-материальных и, что главное, людских ресурсов.
3. Адаптацию к экономическим условиям рынка следует проводить в условиях установления оптимального соотношения экономической конъюнктуры рынка, объективных законов и требований социальной и экологической сферы. Такой подход следует осуществить в переходный на рыночные отношения период и в последующей перспективе.
4. На фоне происходящего в мире глобального финансового и продовольственного кризиса Грузия должна обеспечить рациональное и целенаправленное использование оказываемой Европой, Соединенными Штатами и международными финансовыми организациями финансовой и другой экономической помощи, проведением работ по совершенствованию рыночного механизма, в том числе банковской, налоговой, страховой систем и проведении других необходимых мероприятий.

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Milk Production Risks in Latvia: Challenges and Solutions

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Abstract
The study shows the necessity and topicality of risk management in dairy sector in Latvia in connection with the changes in the economic situation and investments. In recent years, the EU funds as well as credit resources were extensively used for the modernisation of the dairy sector; however, in the present conditions of recession the farms have problems with credit payments. In order to enhance the confidence about the farming stability and its development opportunities, it is advisable to assess risks. The assessment system of small and middle business risks has been worked out in Finland and is accessible on the Internet. It is necessary to develop the similar system for Latvian dairy sector as well. The case study within the present research focuses on the risk assessment in a dairy farm; such risk assessment diagram could be uploaded on the Internet for businesses as a simple and effective risk assessment tool.
Key words: risk assessment, risk management system, dairy sector, EU funds.

Introduction
Dairy farming and its accompanying sectors account for an essential share in the structure of Latvia's agriculture. In recent years huge investments have become available and one of the ways of business development is the attraction of the EU finances used by many dairy farmers. However, investments mostly involve credit payments that are connected with additional risks. Thus farms encounter internal risks, such as productivity of cattle and crops, diseases, machinery damage; exterior risks, such as price fluctuations of milk purchase and resources, the changes in crediting policy of banks etc. The present situation in Latvia as well as Europe which is characterised by the decrease of consumption and run-down of economic development, has a negative effect on the money circulation and investments in farms or, as it was mentioned in the "The Latvian Macroeconomic Stabilisation and Growth Plan" by the Ministry of Finance at the end of 2008 and adopted by the 9th Saeima (Parliament) of the Republic of Latvia, December 12, 2008: the economic growth has been suspended and even decreased in Latvia, the Baltic states as well as in the euro zone on the whole, hampering the economic activity of businesses to perform profitable deals in domestic and foreign markets. The above mentioned plan includes the promotion of investments, assignations of funds for restructuring economy, particularly focusing on the EU structural funding programmes in the conditions of "frozen" credit resource market (Ministry of Finance, 2008). Even though the investments are apparently important in Latvia's dairy sector, farms should be confident that their business activities will not be threatened and the payments of credit money will not cause serious problems. The safety of investments can be increased by the risk assessment and implementation of the risk management in the business organisations thus diminishing the risk effect.

Materials and Methods
The study is based on the data of the Central Statistical Bureau (CSB), Rural Support Service, "The Latvian Macroeconomic Stabilisation and Growth Plan" of the Ministry of Finance of the Republic of Latvia, "The Strategic Plan of the Improvement of Latvia's Dairy Sector" of the Ministry of Agriculture of Latvia. The risks in milk production were analysed applying the risk assessment analysis and the method of the case study in one of the dairy farms. The risk assessment system by Finnish researcher Jarkko Leppala (Holistic risk management – something for farmers? 2008) is used with the purpose of extending the present risk assessment and designing the risk management system that is suitable for the needs of Latvia's farms.

Results and Discussion

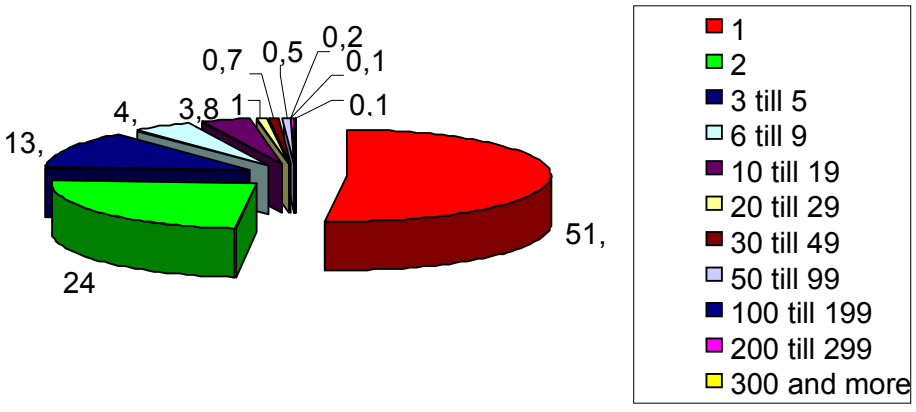
Challenges and solutions of the dairy sector
Dairy sector is one of the most important production branches of agricultural commodities,

and recently its share in the range of agriculture products and the role in the formation of farmers' income have increased. Together with the crop and fodder production the share of dairy production in 2006 accounted for 38% of the total agricultural output. Dairy cattle farming use approximately 840 thousand ha of the land, i.e., 50% of agricultural land (the Ministry of Agriculture).

The dairy production volume in the time period from 2005 to 2007 has increased from 810.3 thousand to 841.6 thousand tons (CSB). The dairy sector has undergone structural changes that have been enhanced by the state and the EU support for this sector. In spite of the recent positive tendencies, the dairy sector is still scattered. According to the data of the CSB and Agriculture Data Centre from 2006, approximately 74% of milk cows are kept in herds with less than 50 animals; the share of the herds consisting of 2-3 cows is quite big; however, such small herds in the conditions of advanced technologies and market development cannot provide the appropriate added value production capacity and efficiency. Figure 1 shows that in 2006 more than 90% of all milk production farms were small (less than 5 cows), and these farms account for 37% of all milk cow herds. The CSB data reflect that in 2006 the average number of milk cows was 180,785; the average size of a herd was 3.97 cows, which is one of the lowest indicators in the EU countries (Latvijas lauksaimniecība un lauki, 2007).

In order to improve the business activity of the agricultural producers, the EU structural funds have become available; the new accounting period this year has started with the total sum of the EU structural funds of LVL 4,530,447,634. The promotion of the dairy sector development is envisaged by the ERDGF that enhances rural development and supports activities for the improvement of farming efficiency. The second most important source of financing in the dairy sector is the EAFRD programme; it assigns money for the implementation of Rural Development Plan (2007 – 2013). Axis 1 relates to the dairy sector, the financial support is meant to be allocated for the promotion of the competitiveness of the agricultural production, its modernisation and technological advancement.

Due to the promising tendencies in dairy production and gradual increase of milk purchasing price in previous years, the dairy sector received funding from the ERDF for ensuring hygienic standards (5,646 activities) for the total sum of EUR 52 million in the time period from 2004 to 2006. Since many farms used this financial support, they needed credit resources for expansion and modernisation. Unfortunately, the sudden fall of milk purchasing price in the spring of 2008 and the rise in the resource price have noticeably influenced and still influence many of these farms. Although "The Latvian Macroeconomic Stabilisation and Growth Plan" (the Ministry of Finances, 2008) highlights the significance of the support in the implementation of deeds that foster the economic activities and export, the situation in the dairy sector remains very troublesome. The existing milk purchasing price does not cover the credit payments, thus creating serous problems for many farms. Therefore the risk assessment is a good solution for the reduction of possible threats. The risk assessment shows the possible risks, their features, possible losses, which, in its turn, help the owners forecast the future situation and make relevant conclusions. One suitable risk assessment and management system has been created in Finland, by Jarkko Leppala from MTT Agrifood Research Institute, and it is accessible on the Internet (Holistic risk managament – something for farmers? 2008). This system comprises Farm Risk Map that



Source: made by the authors according to the CSB, 2007

Fig. 1. **Farms with a respective number of cows (%), 2006**

gives a general overview on the farm risks and provides with the checklist where risks are divided into 4 categories:

- human risks;
- product risks;
- property risks;
- environmental risks.

Each category contains 70 – 188 questions that are formulated in a clear and comprehensible way. The formation of similar system in Latvia could secure farms from possible risks.

Implementation of risk assessment

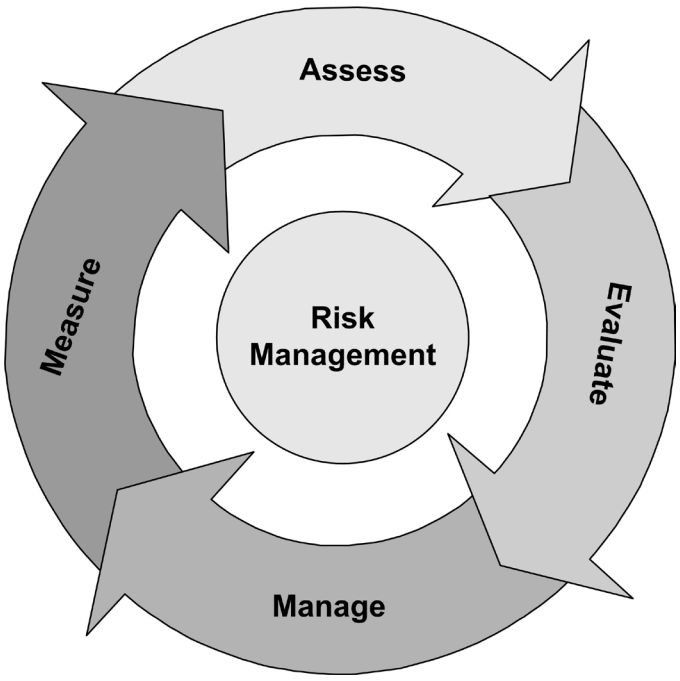
The risk assessment is the identification of the quantitative or qualitative risk value in a particular situation. In order to perform quantitative risk evaluation, two risk components should be determined: potential losses and feasibility; therefore two questions should be answered by the evaluator:

1. Could this risk be possible in a farm and after what time period could it appear again?
2. Will this risk cause losses; how big will they be?

When risks are assessed, the activities should be carried out to decrease or to eliminate them; in addition, the most dangerous threats, possible damage and costs of risk prevention should be evaluated; it is necessary to identify if risks are possible to prevent, reduce or to shift. Insurance measures are used to reduce and shift risks, if prevention is impossible or very expensive. After the implementation of activities, the results should be estimated and the repeated risk assessment should be performed. If it is necessary, risk reduction or prevention activities are repeated as well as preventive measures are carried out, and the risk assessment after a certain period of time is repeated, as it is reflected in the risk management cycle (Figure 2).

Agriculture has been subjected to essential changes that are connected with the market globalisation, rapid development of technologies, regulation expansion and growing environmental protection demands. It has fostered bigger risk diversity. There are several risk classifications; the one used by the European Commission is the following (Hardaker, J.B.,1999):

- **Individual or personnel risks** are connected with the illnesses, injuries, or death of a farmer or farm employees.
- **Property risks** are associated with fire, theft, and other reasons that cause losses or damage of the houses, inventory and other items of property used for the production.
- **Production or harvest risks** mostly are connected with the weather conditions (excessive/insufficient humidity, frost, extreme temperatures etc.) and include risks of plant and animal diseases.
- **Price risks** depend on the potential price rise of raw materials and the potential price fall of the



Source: Tom Olzak, Director of Information Security at HCR Manor Care

Fig.2. **Risk management cycle**

manufactured goods after the production process already has been started.

- **Institutional risks** result from the political changes (including agricultural policy) that influence the decisions of agricultural production and /or sales, and have a negative effect on the business activity. Institutional risks refer to the termination of the agreement as well.
- **Financial risks** include the price rise of capital, currency exchange rate risks, low liquidity and slow circulation of assets.

The above mentioned risks are interrelated. For instance, the institutional risk of the price change support affects the price risk. All risk categories have an influence on the farm incomes (P.Rivža, D. Šantare, 2007).

The case study explores the risks in six categories according to the above mentioned risk assessment model. When risk feasibility and possible losses are estimated the ratio (total value) is determined, and the risk essentiality is stated from the risk assessment diagram (Figures 3 and 4).

The case study uses the farm "Rudeņi", which is situated in Sesava parish, Jelgava district, its owner is Pēteris Knope. The farm "Rudeņi" business activities include milk production, fodder production, growing of crop (winter and summer wheat, oats, barley) and rape. The farm owns 120 milk cows with the average milk yield of 9,000 kg and it uses 537 ha of land. In order to expand milk production and meet the demands of the quality and competitiveness, the farm has implemented two SAPARD projects and has set off an EU project to build a new cowshed; there are plans to submit another project for the bio-fuel production plant. The dairy and grain production, produced in the farm is sold through the cooperative.

As it is possible to see from the risk assessment, the most important risks refer to price risks: the fall of milk purchasing price and the price rise of production resources that have high feasibility and noticeable losses. In terms of the prices of production resources, the farm is mostly affected by the increase of fertilisers, fuel, and electricity. The price rise of fodder supplement influences the farm comparatively less, partly due to the fact that the farm signs a contract with the cooperative for the fodder additives supply. Cattle disease risk plays an important role, it leads to the individual or personnel risk, i.e., the damage done by the low qualification of the personnel. For example, daily milk yield could be damaged because of the negligence or inattentiveness of the personnel. This farm as well as other farms employs workers for basic jobs with low education and low level of responsibility for the cattle and property, therefore strict control and supervision is necessary. The new farm project foresees computerisation of the

Feasibility/ Risk / **Maximum possible losses**	Very small possibility	Small possibility	Possible	Highly possible	Certain
Insignificant losses	1	2	3	4	5
Small losses	2	4	5	6	7
Average losses	3	5	6	7	8
Significant losses	4	6	7	8	9
Very significant losses	5	7	8	9	10

Source: created by the authors using Oracle Services data

Fig. 3. **The risk assessment diagram**

1 - 4	Acceptable risks	Observation, preventive measures
5 -7	Partly essential risks	Pay attention, carry out activities for the reduction and elimination
8 - 10	Essential risks	Emergency activities for the reduction and elimination

Source: created by the authors using Oracle Services data

Fig. 4. **Determination of risk essentiality**

Table 1

Risk assessment in the dairy farm "Rudeņi"

Risk	Feasibility	Losses	Ratio
Individual or personnel risks			
Diseases of employees (including alcoholism)	2	2	4
Damage caused by unqualified personnel or inattentiveness	3	5	8
Risks caused by wrong decisions of the owners or managers	1	5	6
Property risks			
Fire	1	1	2
Theft	1	1	2
Production or harvest risks			
Cattle diseases	4	5	9
Bad weather conditions (fodder harvest)	3	2	5
Damaged equipment	2	4	6
Fodder storage losses	1	1	2
Price risks			
Milk purchasing price reduction	4	5	9
Price rise of production resources	4	4	8
Price rise of services	4	3	7
Institutional risks			
Support payment policy changes	1	1	2
Adjustment in the EU structural fund payments	4	2	5
Termination of the contract with milk buyers	1	3	4
Termination of the contract with milk buyers from the cooperative	5	3	8
Adjustment of taxes (VAT)	5	4	9
Financial Risks			
Bank crediting policy changes (interest rate)	3	4	7
Changes in crediting terms	3	2	5
Risk	Feasibility	Losses	Ratio

Source: made by the authors according to the data of the dairy form ″Rudeņi″

production process thus diminishing the role of the mistakes on the production output. Another serious risk is the termination of the contract; if the farm has signed the contract with the cooperative the risk is reduced; the cooperative in further sales, in its turn, has the risk of the adjustments of the sales volume and prices. Another serious risk is tax adjustments, i.e., in 2009, VAT has increased from 18% to 21%; this change results in the rise of the purchase price of resources thus decreasing the demand for the manufactured goods.

Another level of risks, i.e., partly essential risks, include the risk of wrong decisions by the owners or managers, that has a low feasibility but could cause big losses or the lack of profit. Besides, partly essential risks include bad weather conditions since the farm provides fodder, grows crop and rape, and weather conditions can have an influence on the harvest. Damaged machinery during the harvest can lead to serious losses; broken milking and cooling equipment can affect the health of cows and the quality of milk. The owner of the farm considers that

the price rise of services, e.g., veterinary services, is a partly essential risk. A high feasibility risk but with small losses refers to changes in payments to the European Union structural funds, which is expressed mostly as an unearned profit, since the farm is implementing the project and is ready to start another one. Partly essential risks are financial risks: changes of banking crediting policy, adjustments of interest rates and crediting terms might cause serious financial consequences. If the bank raises the level of the collateral, the farm will not be capable of taking another credit for the implementation of further projects.

Acceptable risks include illnesses of the employees, mostly alcoholism. This risk does not cause direct losses, since the workers could be replaced. Property risks, thefts and fire damages, are not considered essential, because the farm has signed an insurance agreement thus the risk is shifted to the insurance company. Thefts do not happen often, thus not having a serious influence on the business activities. The food losses are insignificant. Policy changes of the support payments do not have noticeable influence, because support payments account for small sums and the expenses are covered from the farm's income from the business activities.

The study of the dairy farm demonstrates the necessity of the risk assessment of potential risks. The solution of how to make the risk assessment more accessible for the farmers would be the implementation of the risk assessment in the internet medium, similar to the Jarkko Leppala model of the risk assessment for Finish farmers.

Conclusions

The main conclusions that can be drawn from the present research results are as follows:

1. Global and local economic fluctuations have caused difficult and unstable period in the dairy sector of Latvia.
2. Investments, including the EU funding for the advancement of milk production equipment and processes, are necessary in order to promote the competitiveness.
3. Financial investments in farms are connected with risks; therefore it is useful to perform the risk assessment and analysis.
4. The risk assessment among Latvian entrepreneurs is not common and regular, therefore it is important to look for the ways how to encourage the risk assessment.
5. Entrepreneurs and scientists should cooperate and form an easy accessible tool for business organisations for risk prevention, such as a risk diagram with standardised questions on the Internet.

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Sheep Production within the Sustainable Animal Production in Hungary

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Abstract
The question of sustainability of agricultural production especially animal production and events leading to its development can be dated back to the second part of the past century. Sustainability is a priority subject matter as it is a core element in our existence and in the survival of the forthcoming generations. The notion of sustainability comprises three aspects: ecological, social and political, and economic target systems, which by now have been supplemented with cultural and regional elements including the protection of environment, local traditions, scale of values, cultural and historical heritage. The principles of sustainable development also include the improvement of human and animal health and the maintenance of vital rural communities. The priority notion of sustainability of agricultural production refers also to animal production and especially sheep production. Sheep have contributed substantially to the grassland-based agricultural production in Hungary for centuries. Sheep sector is important in rural areas as the tool of sustainability of animal production. It should also be highlighted that contrary to numerous efforts, the globally difficult process of sustainable development poses almost unsolvable problems for implementers even on local and regional levels. **The aim of this paper** is to review briefly the levels of sustainability in the Hungarian animal production with a special regard to sheep production and their content, and then point out the most significant economic issues by the application of "SWOT" - analysis, "problem tree" and "structure of objectives" methods, on the grounds of the received findings.
Key words: sustainability, sheep production, problem tree, objectives tree.

Introduction
Sustainable agriculture and livestock production covers three main goals nowadays: environmental, (ecological) health, economic profitability, and social and political equity. Local levels have failed to receive that much attention, although certain tasks such as sustainable agriculture or regions are much more likely to be solved on local (national) levels. Csete L.-Láng I. (2005) asserted that the sustainable development of agro-economy can result within the system of correlations and interactions among content, tasks and levels. Geographically scattered different size agricultural producers play a significant role by the introduction of sustainable farming systems and the operation of sustainable enterprises; however, they provide new opportunities for the exploitation of regional and national levels as well. Utilising livestock in agriculture often improves the sustainability of the system of an environmental (ecological), economic, and social viewpoint. Animal production can be economically sustainable because of its role in trade, market and feed supply disruptions, diversifies producers' activity, decreases controls risk at farm and national level, and enhances farm maintenance, increases job possibilities for the rural population. But in a globalised and also highly regulated economy is it a more complex problem. Sustainability of course next to economic aspect depends on the two other aspects and especially the attitude of people and politics. The evaluation of sustainability also basing on the level of examination: local, regional or national.

The levels and content of sustainability in a general consideration
On the grounds of physical extension, sustainability can be divided into global, cross-border regional, national and local levels. The global level comprises problems affecting the whole world, such as poverty, health care, the protection of climate and climate changes. The regional level extends national borders. This level should not be confused with the EU regions as it is rather a natural-geographical than an administrative category. However, the two categories often overlap, just like in the case of the EU development regions. Their common interpretation is primarily geographical, e.g., the sustainable

development of the reservoir system in the Carpathian basin. The national level is clear and needs no further discussion. The local level encompasses a much wider area, as it can include a range from production areas, settlement municipalities to county or higher level areas of public administration. Agriculture and within that animal production extends to all the four levels directly or indirectly as well. If only Hungarian animal production is taken into consideration, it evidently covers mostly national and much less regional levels. From among the content features of sustainability, the authors highlight the target oriented system of thoughts and behaviour and a way of life in accordance with it. Therefore we can fully identify with this idea as this can be regarded the fundamental condition for the expansion and efficiency of sustainability. If heads are "clear" it can promote the long range preservation of natural environment and the reasonable utilisation of natural resources. The following two content elements are production and consumption, which mean that practice is converted into changes as regards sustainability. These elements can be quantified and supervised, thus they can serve as essential facts for the planners of sustainable future. At this point input and output processes can be followed up, analysed and measured; therefore these content elements are called the "alpha and omega" of sustainability. The final correlation originates in the system of relations among natural, social and economic factors, as sustainability itself is an extremely complex system of (facilitating, neutral or inhibiting) interactions. This stochastic or occasionally deterministic system scheme is a sound starting point for our investigation: with what content can Hungarian livestock production and especially sheep production comply with the levels of sustainability? Before dwelling on the answer we need to clarify some notions which take us closer to the field of sustainable animal production.

Sustainable agricultural production and sustainable agricultural enterprises

Animal production forms an essential part of sustainable agricultural production. The greatest proportion, about 65% of produced primary products in plant production is used by animal production *(Csete-Láng, 2005)*. The rest is utilised by personal consumption and industrial processing. All these mean that the volume of animal production, the composition of livestock and the level of its intensity determine the cycle of substances of vegetable origin. The reduction of livestock started in the past decades and continued recently, which can modify the proportion of use but the leading role of animal production will inevitably prevail for long. Harmonization also means that these three elements must not deteriorate, increase at the cost of the others or reduce as compared to an imaginary (or calculated) optimal level. However, the question arises what we can call optimal. The economic results of animal production in the past 15 years are far from being satisfactory and forecasts do not project a positive shift. Drastic cuts in the workforce resulted in the reduction of total economic output and the proportion of the production output of animal production has specifically shifted in favour of plant production. What does it show? Although fewer animals produce lower economic output, more living space time is available for the regeneration of natural resources and for the assimilation of negative influences affecting the environment. Then, can we state that the sustainability of our animal production improved considerably in the past 15 years? Even if we were merely a conservationist we would not dare to say yes. Due to the lack of grazing livestock grasslands have become weedy and they are not used, the sudden upsurge of allergic conditions rooting in this fact also makes those people who worry about the environment think, not to mention economists! The decline of livestock also resulted in the loss of jobs, thus increasing the number of unemployed people who cannot be converted into other sectors, making their assets (stables, machines, equipment etc.) superfluous. As an economic result, cost remanency (cost after existing assets which are no longer used) has soared. In its complexity, this influence spread to local, national and regional levels as well, and its effect can be felt even these days. A new question can be raised: should the number of livestock be increased again? Many would immediately give the nostalgic answer of: yes! Here we would not dare to say clearly "yes". Hungary's animal production potential exceeds the existing one many times. Péter Horn, academician, has mentioned this fact several times in his scientific lectures. There is a potential possibility; we think it is out of the question, but what animal species and in what numbers – that remains to be answered. Sufficient future (or existing) capital is also questionable, just like the existence of trained and dedicated workforce to implement these actions. Is there, will there be a layer of entrepreneurs which can perform developments in a sustainable way? Csete and Láng determined the notion of sustainable agricultural enterprise in their book as follows: "*A sustainable agricultural production, as an enterprise, is sustainable, i.e., is capable of continuous operation, if it is solvent during the financial year and by the end of it the volume of its profit will be sufficient to cover personal incomes; moreover, it can accumulate capital for the development of the enterprise itself*". The comparison of

sustainable agricultural development and sustainable agricultural enterprises refers to sustainable animal production as well. If the two notions are connected and supplemented with each other, we can theoretically get the definitions of sustainable animal production and sustainable enterprise of animal production, as follows: *In the long run, a sustainable enterprise of animal production should operate economically, produce economic results, be solvent and accumulate profit in a way that in the meanwhile forages, drinking water etc. consumed by the livestock can be regenerated as natural resources and their assimilation capacity can prevail in the face of environmental stress due to manure, rumen gas etc.*

Our hypothesis was that sustainable animal production and enterprises of animal production do not comply with this priority condition, therefore they are not sustainable unless the present conditions are changed.

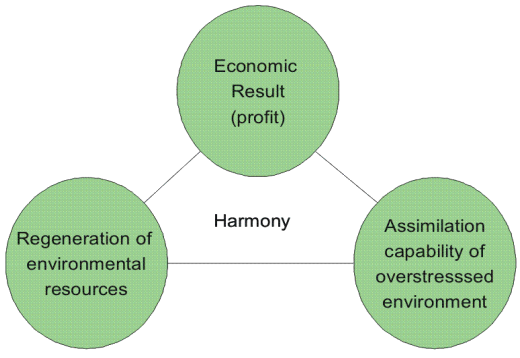
Economic aspects of sustainability

Investigation on the development of costs and incomes in the major sectors of animal production unveils a woeful picture. On the grounds of the calculations made by the Department of Agricultural-Political Research, Institute of Agricultural Research (AKI), almost all sectors of animal production will produce losses in the coming 4 years. Ewe breeding has shown a deficit without land subsidies since 2004; existing national support and SPS coming into force in 2009 will merely mitigate the losses. The loss calculated for 2010 exceeds 1000 HUF/ specimen due to national support and SPS. Therefore, economic outcome cannot be expected in the sectors of animal production or merely as a result of supports. Economic outcomes will not be positive and sustainability on a national level cannot be expected unless the present conditions change. Illiquidity can be forecasted for farms exclusively in the business of animal production, they will have no profit for developments. The 3 characteristic **(Figure 1 and Figure 2)** and determining elements of sustainable animal production and animal production enterprises will not be implemented.

Changes in the number and productivity of enterprises

The Central Statistical Office (CSO) published its economic-typological data on Hungarian agriculture in 2006. Records on the structure of economy in 2005 disclosed that the number of farms specialised in keeping grazing animals reduced from 26041 in 2000 to 18227 in 2005. However, the total value of SGM (standard gross margin = sales revenue – direct variable cost) fell from HUF 38.8 billion to HUF 28.6 billion for grazing animal farms. Therefore, the above mentioned sectors, where losses were forecasted, are likely to suffer further declines; newer and newer farms abandon their productive activities. Both in the number of farms and in the SGM value, private farms show the greatest decline.

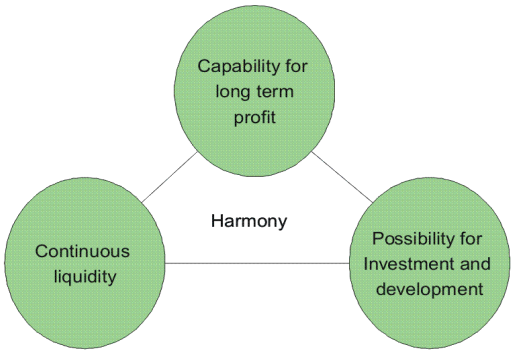
Therefore, the first cornerstone of sustainable animal production, which focuses on economic results and includes further development potentials, has failed to realize in Hungary in recent years. The question arises whether we can speak about sustainability in animal production at all. Our answer is positively yes, but for its actual implementation the present structure and system of conditions must be changed, and the reasons giving rise to the before mentioned tendencies are to be unveiled. If we get a good understanding on the reasons, perhaps we can find the answer how the causes can be terminated.



Source: Csete-Láng 2005

Source: Csete-Láng, 2005

Figure 1. **Sustainable agricultural production**



Source: Csete-Láng 2005, and own

Figure 2. **Sustainable agricultural enterp**

Research methods and materials

In 2007 the Department of Agricultural Economics and Rural Development, Centre of Agricultural Sciences and Engineering, University of Debrecen organised a series of venues entitled "Generation of projects based on sector-specific innovation in various sectors of animal production". The programme was supported by NKTH (National Office for Research and Technology) and ÉARFÜ (North-Great Plain Regional Development Agency) in the framework of the Gábor Baross tender dossier. The above mentioned professional meetings discussed actual issues in the most significant sectors of animal production, such as pig, poultry, sheep, and the questions of milk production in the cattle sector. The participants of the events were requested to expand their ideas concerning the conference lectures; moreover, their proposals in relation to the problems of the sector. The organisers of this series of venues invited the whole verticum of sectoral players and asked them to tell their opinions. In all the issues related to the verticum (improvement, variety, foraging, technology, processing, trade, animal health, sectoral control, watchdogs, economics), well-renowned experts were invited to give lectures and to introduce discussions. The event was interactive, as after certain vertical blocks of lectures participants could give their comments and ask questions. All the participants of the conference were asked to prepare a written memorandum on the advantages, weaknesses, potentials and threats of the sector, and send them for the organisers. Based on this material we prepared the SWOT analysis and the problem tree of the sectors as well as the structure of objectives leading to the solution of the problems. We are introducing the result regarding the sheep sector.

We did not revise what was mentioned and written down there (we did not supplement them and did not take away anything from them). In our opinion, we were not allowed to do so, as all the sectoral players have a good understanding of their own special areas. We merely strived to systematise what was said and written down at the conference. In the subsequent part of the present study we present and evaluate the focal economic issues of sustainable animal production especially sheep production on the basis of this work. The SWOT matrices of sectors were prepared separately, here only the merged tables are presented. As the first step of the relation of cause and effect we considered weaknesses and threats. On the strength of these findings we prepared the so-called problem tree showing elements in logical relation with each other. We outlined the so-called system of objectives to eliminate the problems.

Weaknesses and threats, the problem tree

Figure 3 shows the weaknesses and threats of sheep sector in logical groups. Human factors, production, consumption, processing, trade, capital supply, animal health, and factors affecting the environment are included in separate factors. Our listings follow the alphabetical order and not ranks.

Weaknesses

If we consider sectoral problems, it can be seen that they have a lot of elements in common and several similar weaknesses. In sheep sector where forages are consumed, the lack of sectoral strategies was highlighted. "Hunger" for cutting-edge knowledge, low capacities for pushing their interests and low social prestige, the lack of experts and producers joining their forces were mentioned. In the productive sector high forage prices and cost level were mentioned. Naturally, in accordance with the characteristics of technical sectors, specialities also emerged: the size of plants, indicators of progeny, slurry, forage supply etc. In the problem area of consumption and processing, non-competitive processing structures, product improvement and the lack of innovation, inflexibility were shed light on. Naturally, there are specific sectoral problems here as well. Low national consumption, the lack of processing capacities, the low level of processing were mentioned in the sheep sector. Commercial weaknesses were worded briefly but concisely. Marketing or its community versions are missing or their level is low, there is no market protection but markets get narrower and sales attitudes are underdeveloped. In the category of capital supply sheep sector opinion was: lack capital! Even the equity ratio needed to make use of supports and for pre-financing is not available. A characteristic problem of capital for fodder users is that in ownership conditions the forage area, livestock and stables are separated from each other. In landscape-protection areas, producers of sheep pointed out existing anomalies.

Threats

In the analysis of threats it seems to be apparent that the number of human factors has reduced as compared with threats. If the existing system prevails for long, threats will include the contradiction between ageing labour force and the simultaneous problem of the ceasing layer of small-scale producers, which can further impair the prestige of animal production. The danger that the forthcoming political leaders may outweigh agricultural experts has also emerged. The spreading of bureaucracy and its unnecessary

SHEEP PRODUCTION	
Sector threats	Sector weaknesses
HUMAN FACTORS Low social prestige of the sector Low capacities and willingness for innovation Breeding policies are inefficient Weak flow of information Untrained sheep breeders Lack of labour High level of opposing interests among the players of the product cycle There is no training and cooperation for sheep breeders (lack of producer groups) **PRODUCTION** Excess need for buildings also due to keeping animals in feed boxes for 6 months Relatively high associated costs (animal health, marking) Low efficiency of labour and area Low progeny indicators Low level grassland management Disintegrated stocks of low numbers of sheep Low level of quality (lamb) Lack of crossings and rams Lack of artificial insemination Lack of sperm testing Total lack of specialised technologies (milk, meat) Imperfections of forage supply **CONSUMPTION, PROCESSING** Low level of processing There is no inner buffer capacity, consumption per capita is low, range of products is narrow Lack of slaughterhouses and meat processing facilities **TRADE** Lack of marketing **CAPITAL SUPPLY** General lack of capital, insufficient property protection Lower level of aids compared to the older EU countries Animal health, environment	Ageing **PRODUCTION** Increasing forage and energy costs **CONSUMPTION AND PROCESSING** Changes in consumers' customs and their negative impacts on sheep farming) **TRADE** Sharpening power relations, primarily due to newly accessing countries Cost-efficient competition on the EU market Constant external defencelessness Hungary's weak bargaining power may prevail for long on international markets Romanian market, as a competitor, forges ahead Reinforcement of Spanish market **CAPITAL SUPPLY** Defencelessness against land owners Reduction or termination of supports **ANIMAL HEALTH, ENVIRONMENT** Dangers of animal health Inland water and flood Increased severity of live animal transport Prion, Q-fever, bluetongue

Figure 3**. Sector threats and weaknesses (authors' own adaptation)**

expansion can set back producers' and processors' vigour. A specific feature of threats is that if the lack of an overall agricultural and rural development strategy prevails among weaknesses in the future, this fact will intensify threats that jeopardize the sector. In the production sector, in the case of forage users, the characteristic danger of fodder price rise can already be forecasted in relation to bio ethanol and bio diesel production. In parallel, income losses due to the prospective increase of energy prices and labour costs can be pointed out everywhere. In the area of consumption and processing a source of danger threatening could not be detected. Several sources of threats have loomed in the commercial sector. The apparent threat endangering the sudden advance of international competitors, the survival of weak market bargaining power, the enhancement of asymmetric successes of interests dictated by trade

and the survival of the black market all impair the position of the sector, and enhance the fear that Hungary may become a net importer in several sectors. The future threat of capital supply has its roots partially in ownership structure. If unregulated ownership conditions and defencelessness against land owners continue to exist durably, this can also pose threats. As regards animal health and environment, all sectors of animal production face several threats. These include diseases, epidemics, inland water and flood dangers, environmental restrictions and extra expenses in relation to climate changes.

The problem tree

If we build the categories of weaknesses and threats onto each other in a logical process, we receive the so-called sectoral problem tree. The complexity of the figures shows that several causes lead to the before mentioned serious causal relations; namely, to competitive weaknesses, to increased national and international defencelessness, to social-societal, economic, environmental, sectoral and market problems, i.e., in one word, to non-sustainability. The logically connected elements of the problem tree show the relations of cause and effect from bottom to top.

The problem tree of sheep production

The problem tree of sheep farming shows that the resultant of problems is focused in a single great block of effects entitled "a sector reacting to economic, social and environmental changes and challenges with difficulty". This indicates that there is no merely one solution for solving the relation of causes and effects and sometimes only various approaches can yield results[1] **(Figure 4).** The lower part of the problem tree lists the problems, which is the same as in the previous ones. If we recall the definition of sustainability, actually we can see that the sector is not stable from this aspect either. This is a relation of cause and effect which further weakens the competitiveness of Hungarian sheep farming, its added value and innovation are of low level, and thus it is not sustainable in the long run. For all these reasons the region cannot retain its population, enterprises are liquidated, landscape gets transformed; production and commerce become unviable. Social and societal problems are embodied in the fact that the sector looses its prestige, the production layer is ageing; however, provincial unemployment, which cannot be converted into other areas, soars. Economic-environmental problems are due to the fact that the capital attraction potentials of sectors are low and as a result of unexploited and neglected grasslands the costs of landscape maintenance and health care increase. A direct consequence of the liquidation of enterprises is the deterioration of the quality of life. Sectoral-market problems are manifested in the fact that due to unfavourable variety structure, yields are low, defencelessness on markets can further increase and the lack of import, low concentration and producers' cooperation can render the sector non-competitive from the outset.

To our understanding, the presented example represents that the logical system of relations in the problem tree built on the SWOT analysis can be well applied for the investigation of sustainability and for the exploration of cause and effect relations. If problems have been analysed in proper detail and logical relations have been explored, the next step will be the reduction, elimination or termination of negatives. Developing the structure of objectives is a suitable method for all these.

Structure of objectives, hierarchy of targets

In animal production, one of the most outstanding and significant areas of agriculture as well as our objective is to increase productivity, job creation, job preservation and value added, to improve competitiveness and simultaneously to rationalise the use of resources. The strategic objectives of the sector can be summarised in one sentence, as follows: to achieve competitive production in Hungary again. To realise this, specific objectives should be worked out, under which we can subordinate concrete, expected results, which can be achieved by the simultaneous performance of activities.

Figure 5 brings together the comprehensive sectoral objectives, expected results and the factors describing realisable activities in the so-called structure of objectives. The layers were built onto each other in the system of the problem tree and we modified it to disclose the relations of cause and effect so that the factors causing disadvantageous situations can be terminated. As it can be seen, the structure of objectives displays 5 well definable specific features (from top to bottom): comprehensive objectives, strategic objectives, specific objectives, expected results and activities. Our comprehensive objective is the one directly above the concrete target, while our results are objectives linked to the concrete target from the bottom, to the realisation of which we rendered concrete activities. From among these we highlight some economically significant issues.

[1] This problem tre is published by Nábrádi András – Jávor András – Madai Hajnalka (2007)

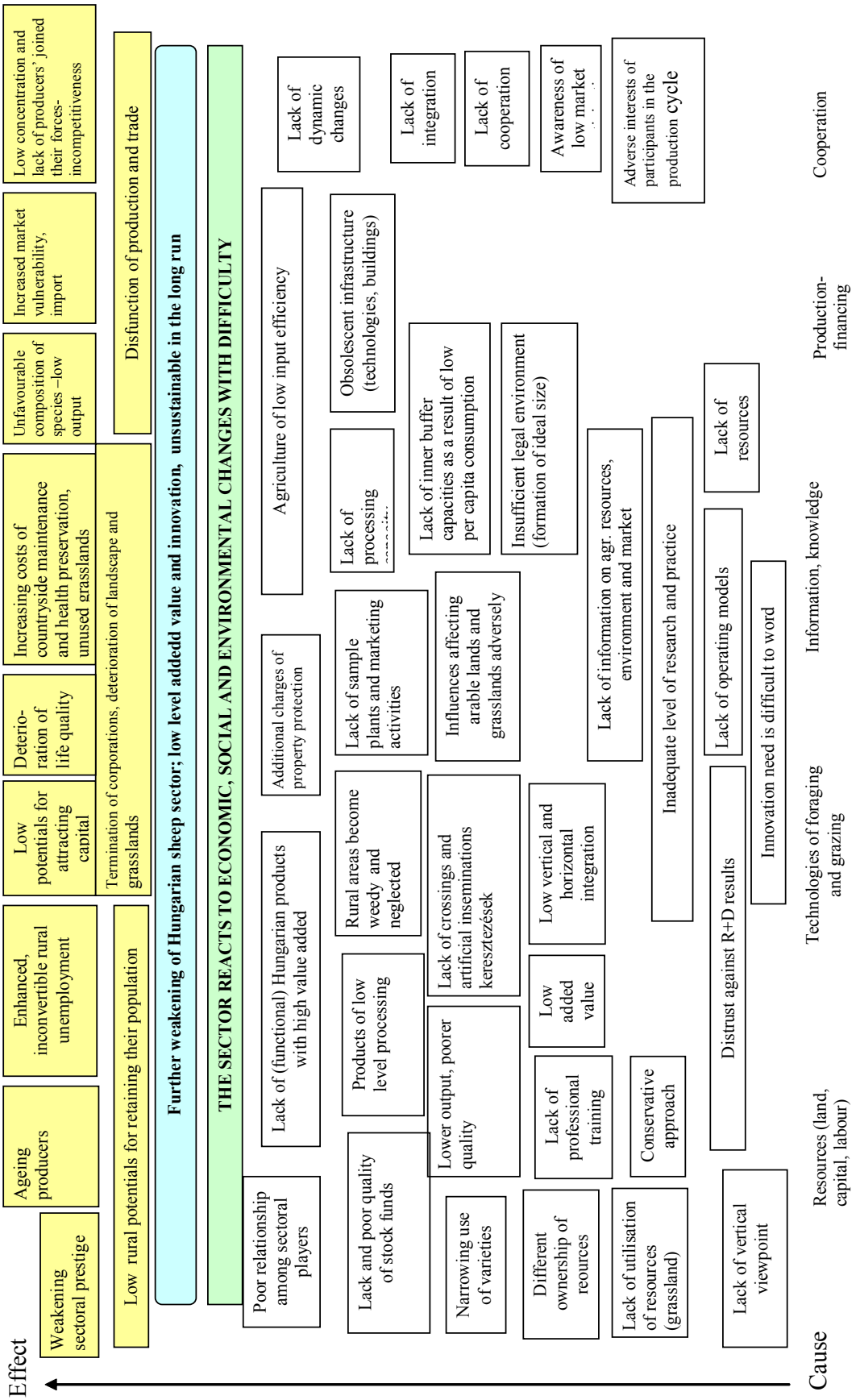


Figure 4. **Problem tree of Sheep sector**

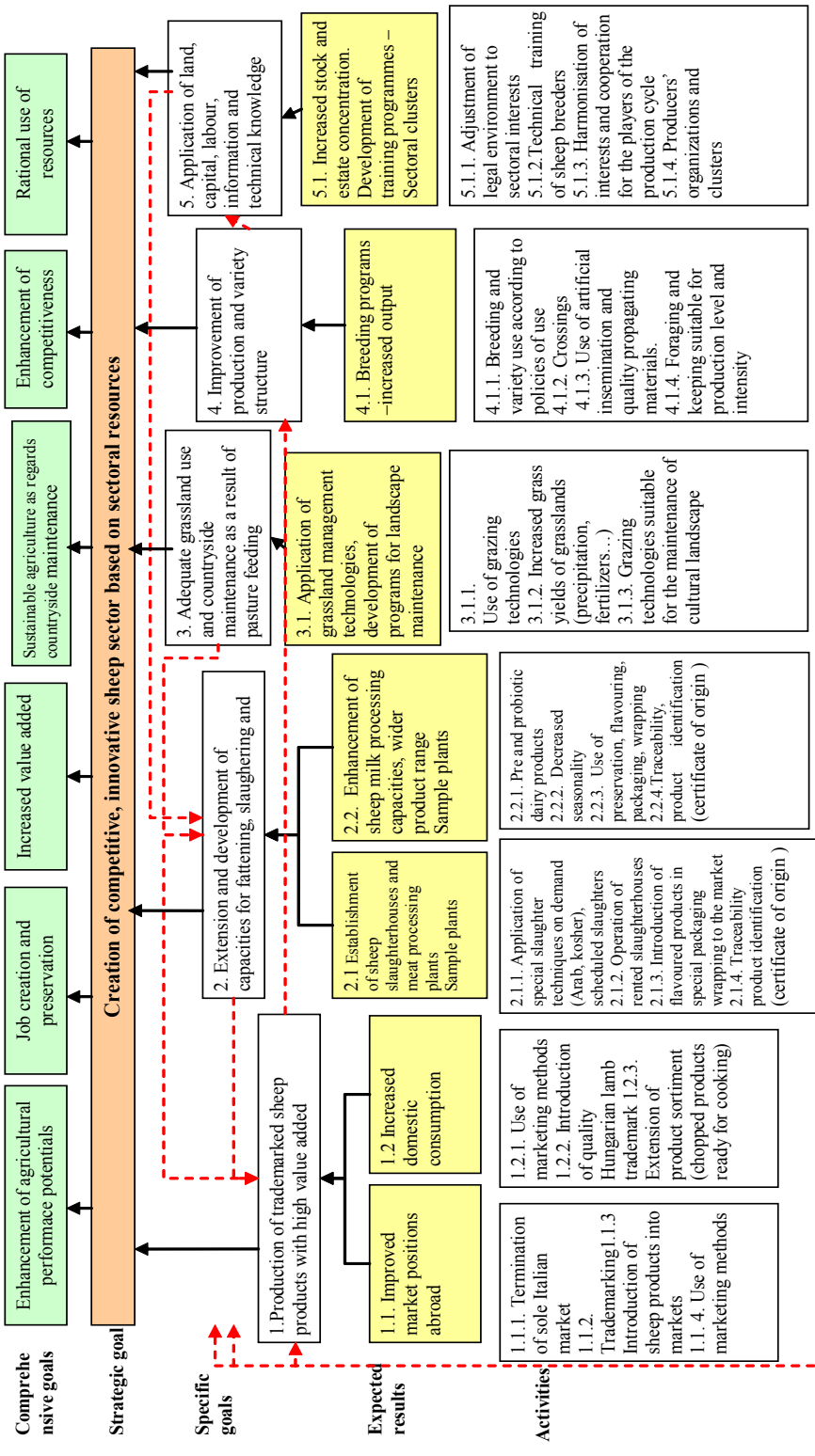


Figure 5. **Tree of objectives for sheep sector**

Content/ Levels	Global	Regional	National	Local
Way of thinking and life				
Natural, environmental and natural resources				
Production				
Consumption				
Natural, social and economic correlations				
Signs and abbreviations used:	Not measurable	Week	Medium	Strong

Source: Csete-Láng 2005 and the authors' own research

Figure 6. **The levels and content of sustainability in Hungarian animal production**

Evaluation of sheep production in sustainable point of view

In the system of the structure and hierarchy of objectives it must be stressed that certain elements of potentials and their realisation separately can improve the situation of a producer or trader, but it should be noted that in the case of the whole sector of sheep farming, merely complex measures can lead to sound effects. The above listed factors are not of the same importance from the viewpoint of the development, productivity or sustainable development of the sector. We really cannot stress the strong correlation among activities enough. If only one or two elements are highlighted and implemented, and the other factors are left unchanged, this can result in endangering the competitiveness of the whole sector, independently of their actual weight. There is another extremely important element, which is true not only of sheep farming but of the whole sector of animal production as well. Responsibility on the policies for the development of the strategic, operational and support system of the sector cannot be fitted into the system of the hierarchy of objectives easily. The dismal opinion that this is the weakest point in Hungarian animal production is shared by numerous professionals. In the table of the structure of objectives in sheep farming (Figure 6) a special element of activities occurs, which is collectively called a horizontal activity (then result, specific target built on to it). The word "horizontal" denotes that it is related to all activities. If we have a look at this figure, it shows background developments for infrastructure, extension and human resources necessary to realise these activities. We consider the preparation of economic models, the inclusion of quality insurance and supervision systems into the process and the clarification of social, economic and moral issues in relation to developments a highly significant element. The table of the structure of objectives also presents that certain elements are built onto each other very strictly; while others are in a synergic relation with each other. The most important relation of this figure includes the building of specific objectives, expected outcomes and concrete activities on one another. Specific objective 5 can be achieved through expected result 8, which presupposes the implementation of 26 concrete activities. If we survey the first system of objectives, the following logical series can be set up*: the application of marketing methods, the introduction of sheep products into markets, trade marking, the termination of the single Italian market, our foreign market position can improve, which, besides the simultaneous increase of domestic consumption, incites the production of trademarked sheep products with high added value, and thus promotes the creation of competitive and innovative sheep farming.*

The so-called "cluster" name can be found under the group of activities 5.1.4. As in sheep farming it is mentioned for the first time, its essence is detailed in the following. The National Development Plan stipulates the support of developments grounded on conjunctural policies and policies for the improvement of competitiveness included in a system or cluster, which is to be developed into network systems of innovation. The cluster organisation can only be effective if problems are approached from the product (market) side and after starting from the regions, the process increasingly covers the sector partially or fully. Besides including the elements of education, research and development, the cluster shall be mostly made up of producers. The success of such organisation requires an attitude change and the realisation of joint

interests from the sectoral players. This joint interest includes competitive production and sale which is the basis of a prosperously operating sector. Clusters representing the first stage of cooperation can be described as follows: clusters are networks made up from enterprises and institutions that represent a relatively high number of enterprises, a relatively low number of economic sectors and cooperate with each other in a relatively small geographical area. In certain clusters professional organisations, chambers, research and educational organisations participate, while others include governmental institutions as well (central, regional or local ones). Many times, the basis of network development is joint marketing, joint design, joint sponsoring and jointly realised training; however, jointly realised innovation and technological transfer also play an increasing part in the activity of the cluster. In the case of a regional cluster, joint activities are mostly integrated by the intention to develop the home area. A good cluster improves itself and sooner or later it converts into a system of innovation. As a result of Hungarian economic and market conditions clusters cannot be formed in a traditional way in certain regions. Therefore, when clusters are established, similar methods for the generation of projects are to be used and clusters are to be organised in an active, induced and supported pathway. As the first element of cluster creation, the participants of the cluster have to identify their problems and then they have to develop a joint system of objectives which suits their interests. Entrepreneurs and researchers, developers, producers, traders for the production of quality and marketable products perform their activities to achieve their common objectives by forming a single profile, representing their joint interests, but retaining their independence. Sheep, milk, wool and products made from them, the production of breeding animals, the production and marketing of reproductive materials can be focal points among the objectives of the cluster. In the interest of the future, tenacious labour is coming now, as the successful solution of problem requires adequate political or social background and sectoral climate. The organisation of the sheep sector cluster or clusters has been started by the University of Debrecen.

Summary, conclusions and proposals

Our hypothesis, which claims that under stationary conditions sustainable animal production with a lot of factors and animal breeding enterprises cannot be maintained, has been duly justified. The reasons behind the negative tendencies are manifold and various. They can only be disclosed by the inclusion of the whole verticum of sectoral players. The Department of Business Economics and Marketing, Faculty of Agricultural Economics and Rural Development, Centre of Agricultural and Technical Sciences, University of Debrecen organised a series of venues by using tender resources in 2007, where all the players of the product cycle could tell their opinions. The actual problems, the strengths, weaknesses, opportunities and future threats of the pig, poultry, milk and sheep sectors were summarised on the one and two-day venues. On the grounds of these venues, by the application of the logical methods of the problem tree, the hierarchy and the structure of objectives, we identified the system of objectives for the sustainable operation of certain sectors, the expected outcomes for the achievement of objectives and the activities to be performed there. The results for the sheep sector were presented in this paper.

We cannot state that the problem of sustainable animal and sheep production has already been solved now. We have just taken the first steps to achieve this noble purpose. What is clear and inevitable follows like this:

1. The precise and expedient clarification of all the problem spheres relating to the sectors of animal production is reasonable by the inclusion of all the participants of the product cycle in similar structures.
2. The starting point of analysis is to disclose the relations of cause and effect.
3. By setting up the structure and hierarchy of objectives, activity tasks can be identified.
4. All these tasks should be coordinated according to a time schedule and included in a complex system, and after this, the strategic plan in sectoral breakdowns and then it shall be developed for the whole sector. If only certain activities are pointed out and realised, this can pose a lot of threats.
5. The triple pillars of sustainability, the fulfilment of environmental, social and economic expectations can only be implemented by laying down the strategy.

As a final thought, we return to the introduction. How and to what extent is Hungarian animal production and within that sheep production linked to the level of sustainability? The influence of our national produce is little if any on global problems affecting the whole world, such as poverty, health care, climate protection and climate changes. However, cross-border regional impacts are implemented. The analysis of the national level is the area where decision makers can contribute to sustainability profusely. Local areas are the widest ranges, the actual scenes of activities, which may cover a particular farm, a site of production, settlement-municipalities, country or national level areas of public administration as well.

The question remains: with what content? Let us present our subjective opinion **(Figure 6).**

Although our production and consumption are insignificant globally, the export-import activities of our animal production are measurable in the world trade, even if only slightly. On regional level its impacts are of medium power, on national and local level its impacts are distinctly strong. Its relation to the countryside, natural resources and natural, social, economic correlations and interactions is weak on regional, medium on national levels and strong on local level. In our opinion, the greatest problem in the relation of sustainability and animal production is posed by the way people think and live. As we have mentioned, our judgement is subjective. From among the major content elements of sustainability, purposeful ways of thinking, behaviour and lifestyles matching them are decisive. This is the basic condition of widespread sustainability or as Csete and Láng state, the efficiency of sustainability and at the same time that of the long-term maintenance of the countryside and the reasonable preservation of natural resources. The process that will produce tangible results in this area will be slow unless implementation is based on willingness, consciousness rather than enforcement or luring. To reach this objective, punishment and support are both needed to strengthen the idea of sustainability from step to step.

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Problems of Dairy Farming and their Solutions in Latvia

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Abstract
Dairy farming is one of the basic industries of agriculture in Latvia. Since the end of 2008 incomes of dairy farmers are sharply decreasing, and there are significant problems for sustainability of this industry. Milk production costs sharply increase, while milk purchase prices are not adequate for the development of industry. The first precondition for the industry development is a lack of milk products in the domestic market. The second precondition that determines and will determine the need for producing milk and milk products is their export. Presently Latvia exports almost 40% of the milk output. Even now it is possible to expand the export of milk products, as the demand for milk products rapidly increases in the world market. Only a production system having competitive dairy farms and the existing ones strengthened at all economic stages might be perspective. The industry will require substantial financial support, first of all for organisations and associations dealing with pedigree cattle breeding, for experiments, scientific researches and their introduction by 2013.
Key words: dairy farming, sustainable development, costs, prices, support.

Introduction
In Latvia, dairy farming is one of the basic industries of agriculture. Over the recent years, i.e., from 2003 to 2008, its role in the proportion of agricultural goods and in gaining incomes has slightly increased. Starting with the end of 2008, the incomes of dairy farmers are sharply decreasing, and there are significant problems for the sustainability of the industry. Only 44.5% of the necessary milk and milk products for the human organism are consumed. The proportion of the consumed milk and milk products show that these products are not produced in sufficient quantities, and they are not available. The prices of these products keep rising and at the same time the population *is short of financial resources* to buy milk products in necessary quantities. *The second factor* that determines and will determine the need for producing milk and milk products is their export. Presently almost 40% of the produced milk is exported. Even now it is possible to increase the export of milk products, as the demand for milk products rises fast in the world market, for instance: in China, India, Germany, the Czech Republic, Poland, Italy etc. *The expansion and sustainability of dairy farming is presently restricted by several factors*. The first most important measure for improving the situation in the dairy industry by 2013 is the financial support for organisations and associations dealing with pedigree cattle breeding, for experiments, scientific researches and their introduction. Based on the strategic programme designed for improving the performance of dairy industry as well as on the legislation of the European Union and Latvia regarding dairy farming, all the economic stages and priorities will be strengthened at the national level. *In the future, the output of milk is associated with the emergence of competitive dairy farms and the strengthening of the existing ones*. An important role is played by modern competitive technologies allowing reduction of production costs, improving livestock feeding through changing their feeding patterns and reducing feed costs, and at the same time cooperation among dairy farmers is important as well.

Hypothesis: support for dairy farming and adjustment of purchase prices provide sustainable development of Latvian dairy farming.

The **research aim** is to analyse the indicators of dairy farming, and to find problem solutions for the sustainable development of industry.

The main **research tasks** are:
- to analyse the dairy industry in Latvia;
- economic efficiency in milk production – costs, prices, and expansion possibilities;
- to give recommendations for the expansion of milk output in Latvia.

Materials and methods
The research is based on the monographic method, the methods of synthesis and analysis, and the logically constructive and statistical data analysis methods, using official data of the government and the Ministry of Agriculture as well as on the experience of practical work. The research tasks are executed by using the accounting calculation methods.

Results and discussion

Dairy farming in Latvia is one of the key industries of agriculture. In 2007, 841.6 thousand tons of milk were produced, which was by 3.9% more than in 2005 (Table 1). The slight increase in the output can be explained by an increase in the milk yield per cow a year, i.e. by more than 270 kg or 6.2%, while the number of milking cows decreased.

Anyway, the output of milk and milk products depends on the productivity of cows (milk yield), pedigree cattle breeding, herd expansion, and quality feed. Over a period of five years from 2000 to 2007, the number of cows has decreased by 25.1 thousand or 12.3% (Table 1).

The average milk yield per cow in 2007 was 4636 kg or by 18.9% more than in 2000 and by 9.1% more as compared to 2005. As to production efficiency, there was a slight increase in the dairy industry in 2007. According to the information provided by the state agency *Agricultural Data Centre* (ADC) on the situation in dairy farming as of 1 May 2008 (Table 2), the dairy herd broken down by owner groups (the number and size of dairy farmers might be compared with the number and size of farms) has slightly improved as compared to the same period in 2007. As

Table 1

Number of cows and average milk yields per cow in Latvia

Indicators	2000	2004	2005	2006	2007
Number of cows, thousand	2045	184.4	185.2	180.8	179.4
Milk yield per cow a year, kg	3898	4251	4364	4492	4636

Source: CSB data [3]

Table 2

Changes in the breakdown of cows by owner groups as of 1 May 2007 and 2008

Farm sizes	Number of milking cows in farm size group			
	As of 1 May 2007		As of 1 May 2008	
	Number	%	Number	%
1 – 5 cows	68 290	36.57	59 256	31.48
6 – 50 cows	67 994	35.84	72 979	38.78
51 – 100 cows	18 002	9.49	18 802	9.99
101 and more cows	35 386	18.65	37 145	19.73
Milking cows in total	189 672	100	188 182	100

Source: author's calculations according to the ADC data

Table 3

Balance of milk 2004-2007, thou. t

Balance indicators	2004	2005	2006	2007*
Milk and milk products produced (in terms of milk)	786.4	810.3	815.1	841.6
Import of milk products (in terms of milk)	85.1	80.5	138.3	127.6
Consumption of milk and milk products (in terms of milk) – incl. consumed as food by people – incl. consumed as feed	733.3 599.3 134.0	670.6 542.1 128.5	623.1 507.4 115.7	641.4 539.6 101.8
Export of milk products (in terms of milk)	144.0	204.4	327.1	327.5
Total consumption of milk and milk products	733.3	875.0	950.2	968.9

* provisional data

Source: CSB data

of 1 May 2008, the number of cows on small farms has decreased by 13.2% during a year, and 31.4% of cows were owned by small farms. However, the numbers of cows on medium-size farms (6-50 cows) and large farms (51 and more cows) have significantly increased, accounting for 38.8% and 29.7% of the total number of cows respectively.

According to the information provided by the ADC (Table 2), it is possible to identify trends that allow us to forecast that the situation by the end of 2008 will show a further restructuring of dairy farming. Yet the indicators shown and analysed in the research still prove that the dairy industry of Latvia is very fragmented.

The import of milk and milk products accounts for 127.6 thousand tons or 13.2% of the total of 968.9 thousand tons produced in 2007 (Table 3). But the export of milk and milk products (in terms of milk) is 327.5 thousand tons or 38.9%, and the domestic consumption of milk accounts for 641.4 thousand tons. According to physiological standards, practical statistics, and experience, every Latvian resident has to consume 480 kg of milk containing 3.5% fat and 3.0% proteins.

On average, a country with 2.35 million population (including tourists) has to produce and consume 1128 thousand tons of milk; we consume only 47.8% of the amount of milk products necessary for the human organism. It is caused by an insufficient output of milk products and a continuous increase in their prices, which does not allow many residents with lower incomes to buy these products.

The second factor that determines and will determine the need for producing milk and milk products is their export. Latvia has always been an exporter of milk products. In 1938 in terms of milk, Latvia exported 564 thousand tons of milk, while in 1988 – 556 thousand tons (possibly more). Now in 2007, the export reached 327.5 thousand tons, which accounts for only 58.9% [1].

Latvia exports milk products mostly for their further processing, whereas milk products are imported mainly for immediate consumption. There was a trend in 2008, too, that the export of Latvian milk products exceeds their import.

According to the information provided by the Ministry of Agriculture, in 2006 an increase in the export of milk products outpaced that in the import by 4% and in 2007 by 11%, which is a positive achievement for our economy; both the export and import prices increased simultaneously at the end of 2007.

An increase in the output of milk in 2007 was substantially impacted by an increase in the milk purchase prices when the prices exceeded the price level of 2005 by 38% as well as by reducing the impact of seasonality. The general principles for organising the market of milk and milk products are set by the Council Regulation No. 1255/1999 issued on 17 May 1999. However, the conditions for adapting and implementing every mechanism of the milk market are separately regulated by the EU and Latvian legislative acts. The EU agricultural support programmes in Latvia are administered by the Rural Support Service. If compared to the European farmers, Latvian farmers get and will get smaller incomes because the dairy industry is fragmented. The largest part of milk is produced on small farms with low competitiveness. The farms having just 1 to 10 cows produce around 78% of milk.

Milk production costs and purchase prices.

Table 4

Costs and purchase prices in milk production for Latvian statutory companies*, LVL/t

Year	Cost of milk, LVL/t	Losses from selling dairy cattle for meat referable to milk cost, LVL/t	Total cost for producing 1 t of milk, LVL	Milk sales price, LVL/t
2007	180.00	40.61	220.61	210.20
2006	147.20	17.85	162.77	182.40
2005	132.10	27.07	159.17	173.00
2004	110.30	19.40	129.70	145.70
2003	92.40	17.81	109.91	108.90
2002	91.40	14.41	105.81	109.60
2001	89.82	18.14	107.96	107.40

Source*: author's calculations using the data provided by J.Belavnieks, Latvian Association of Statutory Companies, on April 10, 2008

Presently our farmers get a relatively low price on milk. For instance, farmers having few cows are paid on average LVL 0.14-0.16 per kg of milk, whereas the owners of large herds up to LVL 0.26. So there is a large inequality among purchase prices of the same product. It implies that small dairy farms have to cooperate in supplying milk. To strengthen and support small milk suppliers, small milk quality test laboratories have to be restored and used, i.e., milk processors and their activity assure a milk price for suppliers in accordance with the content of fat and protein; besides this process is under control.

It can be observed that the milk purchase price has risen over the recent period, but the dissatisfaction with the price between producers (milk suppliers) and milk processors is still large. As of the beginning of 2008, wages of the population have risen, but all food products, including milk and milk products, are expensive. It promotes the import of food, milk and milk products, leading to loosing a quite large part of the domestic market [5]. An increase in the prices of food products, including milk goods, at food stores might be profitable for merchants, processors, and partially farmers, but it worsens the well-being of consumers and increases inflation in the country. Decreasing the milk production cost and increasing the milk sale (purchase) price is a precondition for developing dairy farming just like any other industry. Presently it is hard to speak about decreasing the cost. This problem could and has to be solved through the industry's *specialization*.

According to the author's (Ī.Vītola) estimates, using "Calculations of Gross Margin for Farms in 2006" published by the Latvian Rural Advisory and Training Centre, the cost of 1 kg of milk on extensive farms with an average milk yield of 4492 litres per cow a year could be LVL 0.154 in 2007, whereas on intensive farms gaining 6807 litres per cow – LVL 0.146. When estimating the average milk yields on intensive farms, the weighted average milk yields of herds were calculated, i.e., the milk productivities of Holstein and Latvian Brown breeds were calculated; at the same time taking into account the proportions of both breeds in herds. According to the estimates, the annual profit per cow might reach almost LVL 300 on extensive farms, which is a very little sum of money, whereas on intensive farms – LVL 898 a year.

The cost of milk goes up fast due to the increasing prices of resources, especially feed and electric energy. Overhead (indirect) costs include an enterprise (farm) expenses on management and transportation needed for the functioning of a farm, real estate taxes that may vary per 1 kg of milk, depending on annual milk yield.

A large quantity of meat is gained from milking cow herds every year after culling. This meat may not be regarded as a product in its economic sense. In this case, part of a herd is sold, and the income gained from the sales has to be used for growing new milking cows. The income gained from culled cows entirely provides many farms with the necessary funds for regenerating their herds. A different situation is on farms having a lot of pedigree cattle. For these farms, sales of culled cows make losses because the income gained from sales is below the balance value of cows. The losses suffered from selling dairy cattle for meat that are referable to the milk cost (Table 4) are calculated as follows:

$$Z = \frac{C_n - C_0}{H},$$

where

Z – losses

C_n – balance value of cows;

C_0 - sales value of cows, excluding an increase in cows' body weight during the first three lactations;

H – productive period of cows.

This fact is not taken into account when assessing the viability of dairy farming; in essence, it is the depreciation of productive pedigree cattle. There is one more fact that *makes a concern* – the depreciation of fixed assets is not included in accounting. Owing to this fact, small dairy farmers still are in business. It means that buildings, machines, and equipment will wear out, but there will be nothing to replace them.

According to the author's estimates, one can conclude that only large farmers are able to produce milk at relatively low costs; reforming the Common Agricultural Policy (CAP) is oriented towards promoting modernisation of agricultural producers and assuring competitiveness.

It is forecasted that the quantity of milk produced in the EU during 2007-2014 will remain stable, i.e., the current quantity without sharp changes [9].

According to estimates of the Latvian Ministry of Agriculture and the EU, the number of household plots with 2-3 cows and milk production for self-consumption will decrease in the new member countries after 2009; the dairy industry will be concentrated and modernised.

Taking into account the present situation (the end of 2008) in the country, all efforts have to be made to support farmers' self-employment and

Table 5

Average economic indicators for milk production per farm broken down by economic size groups in Latvia in 2007

Economic indicators	On average	2 – 4 ESU	4 – 8 ESU	8 – 16 ESU	16 – 40 ESU	40 – 100 ESU	100 – 250 ESU
Share of milk in net turnover, %	61	56	56	62	62	63	73
Milk produced, t	72.3	18.5	41.1	72.9	178.4	385.3	1696.2
Weighted support for milk, LVL	2687	890	1573	2802	5815	16 555	41 483
Profit on milk sold, LVL	1042	- 395	1234	263	3733	10 314	106 535

Source: SUDAT [2]

production for self-consumption, i.e., farmers have to generate incomes and create possibilities for viability themselves. Establishing agricultural cooperatives can temporarily provide these viability possibilities for owners of small household plots, or even development possibilities for small milk producers.

Evaluation of dairy farms' financial indicators

Larger profits gained from selling milk can be observed only on dairy farms, the economic size of which is above 8 ESU. It has to be admitted that on average the share of milk in the net turnover of farms was 83% in 2007. Small dairy farms suffered losses [8]. However, there is a definite trend - with increase in the size of farms and, respectively, in the number of cows on farms, profits form selling milk substantially increase because the quantity of milk sold and the financial support for milk production increase.

According to the data of Table 5, one can conclude that in the financial and economic year of 2007, small farms (less than 4 ESU) operated with losses caused by milk production, but farms as big as 16-40 ESU had a profit of LVL 3733, which is 2.8 times less than in 2006 [7], but in 2008 these indicators worsened even more for small farms. According to the data of the Ministry of Agriculture and the Rural Support Service, the largest amount of financial support for milk producers (65% of total) is paid within the framework of the Rural Development Plan's measure "Achievement of Standards".

Milk quotas

The system of milk quotas was introduced in Latvia on 1 May 2004 after the country joined the European Union. The system of milk quotas provided a precise accounting of milk output and sales as well as control from both a quantitative and a qualitative aspect, thus giving recommendations for restructuring milk production.

The total milk quota for Latvia till 2015 was set at 728647 tons or 60% of the quantity requested during the accession talks [4]. Right here is a hindering factor for milk production. Based on successfully performed restructuring measures in milk production, the milk quota for Latvia was enlarged by 33253 tons since the quota year of 2005/2006. The distribution of quotas between the delivery quota and the direct trade quota might change every year, depending on indicators for producer quota redistribution. The producer quota itself has to be variable for a developing industry or the quota system even has to be lifted.

Since 1 April 2008, the total milk quota for Latvia is 743221 tons (including the 2% increase in accordance with the Council Regulation No. 248/2008 passed on 17 March 2008 amending the Regulation No. 1234/2007 regarding the milk quotas for the EU countries). Only 91.1% of the delivery quota was utilised in 2007/2008, meaning that the output of milk has to be increased, and at the same time its quality and the overall competitiveness of milk products have to be raised.

After analysing the figures, one can conclude that milk production in Latvia might be perspective [10]. It is labour and capital intensive, but it provides and might provide viability for farmers who can make little profits that have to be significantly increased. It is of great importance to retain support for cattle farming, including dairy farming, in the form of subsidies and to be able to receive and use the EU Structural Funds. Dairy farmers have to receive export subsidies and subsidies for storing milk products. Both cooperation among dairy farmers and the acquisition of milk processing companies by dairy farmers have to be promoted in the whole dairy industry.

Conclusions and recommendations

1. In Latvia dairy farming is an ancient industry that is fragmented. Almost 78% of milk is produced on small dairy farms, having 1-10 cows, with low competitiveness.

2. The natural and human resources of Latvia can completely provide the domestic market with milk and cattle meat and their products on condition that the market of milk (meat) products is regulated by the laws and regulations; uncontrolled import of these products is stopped.
3. The cost of production in dairy farming sharply increases due to the raising prices of resources, especially feed and electric energy. Only large producers are able and will be able to maintain relatively low production costs – the reforms of the CAP are oriented towards promoting modernisation of agricultural producers, assuring competitiveness as well as increasing output quotas.
4. The EU has politically set a target price of milk - an optimal price that producers have to get for their milk. This milk price is set inside each particular EU member country; it cannot be compared to the present milk purchase price in Latvia.
5. The country has to set an intervention price that milk producers have to get for their milk, so that farmers do not suffer losses.
6. The Ministry of Agriculture has to promote further cooperation between the Latvian Rural Advisory and Training Centre and farmers regarding project preparation and implementation, to improve the educating of farmers and delivery of necessary information for farmers.

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Kopsavilkums

Latvijā piensaimniecība ir viena no lauksaimniecības pamatnozarēm. Ar 2008. gada beigām piensaimnieku ienākumi strauji samazinās un pastāv būtiskas problēmas nozares ilgtspējīgai pastāvēšanai. Strauji pieaug piena ražošanas izmaksas, bet piena iepirkuma cenas nav atbilstošas nozares attīstībai. Pirmais nosacījums nozares attīstībai ir piena produktu nepietiekamība vietējā tirgū. Otrais faktors, kas nosaka un noteiks piena un piena produktu ražošanas nepieciešamību ir eksports. Patreiz eksportējam nepilnus 40 % no ražotā piena apjoma. Arī patreiz ir iespējams palielināt piena produktu eksportu, jo pasaules tirgū strauji pieaug piena produktu pieprasījums. Perspektīva ir ražošanas sistēma ar konkurētspējīgu piena ražošanas saimniecību ražošanu un esošo stiprināšanu visos posmos. Līdz 2013. gadam nozarei nepieciešams būtisks finansiāls atbalsts, kas pirmām kārtām sniedzams šķirnes organizācijām un apvienībām, izmēģinājumiem, zinātniskiem pētījumiem un to ieviešanai.

Technical Efficiency of Estonian Grain Farms in 2000-2006

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Abstract

The aim of this research was to calculate the efficiency of Estonian grain farms to determine the factors that contributed to efficiency. The non-parametric method Data Envelopment Analysis (DEA) was used to estimate the efficiency of Estonian grain farms in 2000-2006. DEA uses mathematical programming to produce a linear best practice frontier over the data and then calculates efficiency measures relative to this frontier. The technical efficiency was calculated for individual farms which use similar inputs and produce the same product (cereals and oilseeds producers). The Farm Accounting Data Network (FADN) data were used to analyse the grain sector in Estonia.

The analysis demonstrated that producers should not benchmark to the highest level of production, but rather should combine resources in land, labour and costs to achieve an efficient level of production, which indeed may be less than the maximum production level of the group.

Key words: Data Envelopment Analysis, technical efficiency, pure technical efficiency, scale efficiency, crop farms and production.

Introduction

Due to differences in growing area and crop yield the grain production has been varying during 2000-2006 between 500-750 thousand tons. Growing area has been affected mostly by demand, the crop yield by climate and the agrotechnical development during the previous years. There has been three phases in the development of growing area from 1980 (Figure 1), the first phase was 1980-1992, when the area was between 400 and 450 thousand hectares, the second phase was 1993-1998, when the area was between 290 and 370 thousand hectares, and the third phase was 1990-2006, when the area was between 260-330 thousand hectares. The sharpest change of growing area was in 2000, when it fell from 330 thousand hectares to 275 thousand hectares, so the total drop amounted to 55 thousand hectares. It is important to consider the fact that in 2001 agricultural census was carried out to find out the area of growing soils, showing that it has been decreased after 2000 and increased a little from 2005.

Comparing the grain yield in Estonia and in the EU, it is 2-3 times lower in Estonia. The reasons are: unfavourable climate, lower usage of fertiliser and crop protection, and poorer agricultural machinery. Comparing the harvest in Finland (with the similar climate as in Estonia) and in Estonia, it is lower in Estonia, which means that possible progress can be made in Estonia (Mertsina et.al. 2006).

Due to the geographical location, unfavourable climate, old agro-technique, opened economy and cheap import price, the provision with grain self-sufficiency in Estonia has not been successful, it has varied between 69-91%. It is important for each country to reach the level of self-sufficiency with grain, specially now, when we have complicated economic situation. During the previous years there have been several changes in agricultural field which are connected with joining the EU. There have been changes regarding the subsidy payments, which have improved the agricultural sector in general and helped Estonia become more equal with agricultural producers of other EU countries.

All the above mentioned facts gave reason to measure Estonian grain producers´ technical efficiency generally and analyse grain producers according to the growing area. DEA method has been used also by many different authors in their agricultural researches (Latruffe et. al. 2004, Davidova S. et. al. 2003, Croppenstedt A. 2005), in Estonia there are two researches made (Vasiliev N. et. al. 2008, Astover A. et. al. 2008). The enterprises in FADN databases were analysed between 2000 and 2006, the period that includes time before the EU accession in 2004, and after. The main aim with this particular research is to evaluate the grain producer technical efficiency, pure technical efficiency, and scale efficiency according to size groups, during the transition and the EU period.

Methodology

Data Envelopment Analysis (DEA) is a non-parametric mathematical programming approach to frontier estimation. DEA is a data oriented,

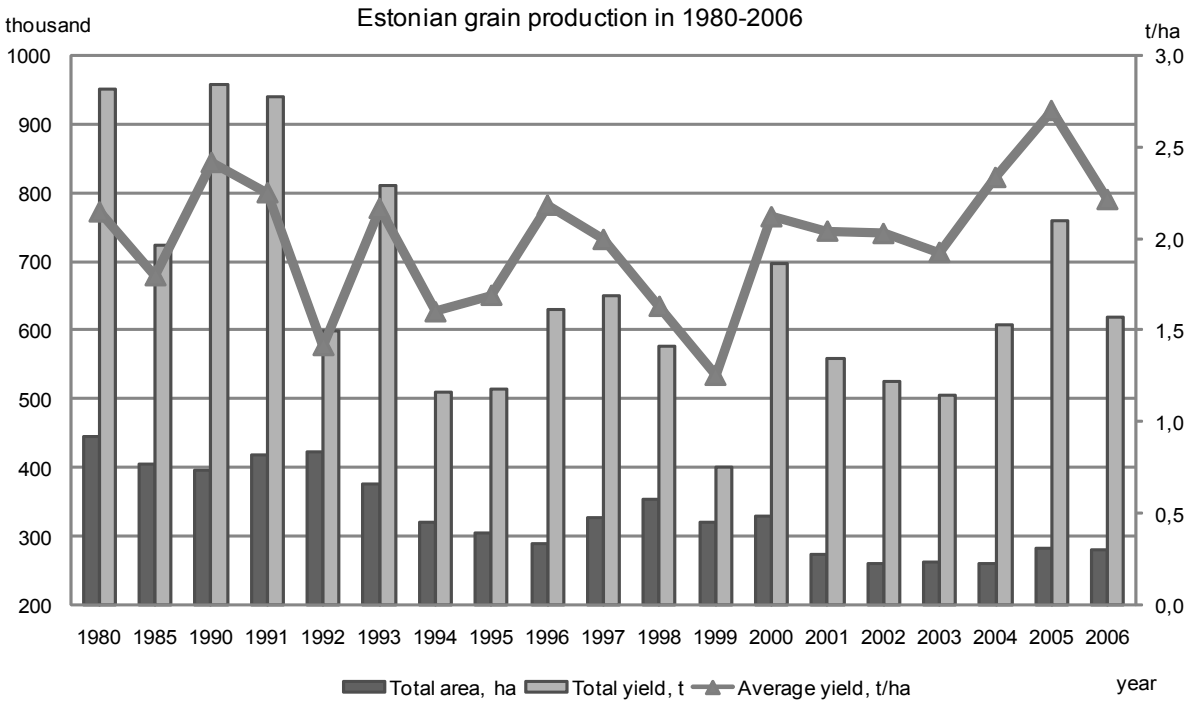


Figure 1. **Estonian grain production in 1980 - 2006**

deterministic approach for evaluating the performance of a set of peer entities called Decision Making Units (DMUs), which convert multiple inputs into multiple outputs. (Cooper et. al. 2004) DEA constructs a frontier by comparing the data of each DMU with data of benchmark DMUs that perform better. Observations lying on the production frontier are defined as technically efficient (TE), those lying below the frontier are considered inefficient. The frontier is composed by solving linear programming models for each DMU (Figure 2).

At first the efficiency score of a DMU is calculated (Formula 1) and used to detect input slacks or output surpluses in a second step (Formula 2). Assume that there are *n* farms to be evaluated. Each farm consumes varying amounts of *m* different inputs to produce *s* different outputs. Specifically, farm$_j$ consumes amount x_{ij} of input *i* and produces amount y_{rj} of output *r*, assume that $x_{ij} \geq 0$ and $y_{rj} \geq 0$ and further assume that each farm has at least one positive input and one positive output value. This model is referred to as the "Farrell model".

$$\theta^* = \min\theta$$

subject to

$$\sum_{j=1}^{n} x_{ij}\lambda_j \leq \theta x_{i0} \quad i = 1, 2, \dots, m;$$

$$\sum_{j=1}^{n} y_{rj}\lambda_j \geq y_{r0} \quad r = 1, 2, \dots, s; \qquad (1)$$

$$\lambda_j \geq 0 \qquad j = 1, 2, \dots, n$$

Similarly we can use model (1) with $\sum_{j=1}^{n}\lambda_j = 1$ for Farm 4, we obtain $\Theta^* = 1$, $\lambda_4^* = 1$, and $\lambda_j^* = 0$ ($j \neq 4$), indicating that Farm 4 is a boundary point. However, Figure 2 indicates that Farm 4 can still reduce its input 1 by 2 unit to achieve coincidence with Farm 3 on the efficiency frontier. This input reduction is the input slack and the constraint with which it is associated is satisfied as a strict inequality in this solution. Hence, Farm 4 is weekly efficient (Cooper et. al. 2004).

$$min \sum_{i=1}^{m} s_i^- + \sum_{r=1}^{s} s_i^+$$

subject to

$$\sum_{j=1}^{n} x_{ij}\lambda_j + s_i^- = \theta^* x_{i0} \quad i = 1, 2, \dots, m;$$

$$\sum_{j=1}^{n} y_{rj}\lambda_j - s_r^+ = y_{r0} \quad r = 1, 2, \dots, s;$$

$$\sum_{j=1}^{n} y_{rj}\lambda_j - s_r^+ = y_{r0} \quad r = 1, 2, \dots, s;$$

$$\lambda_j \geq 0 \qquad j = 1, 2, \dots, n.$$

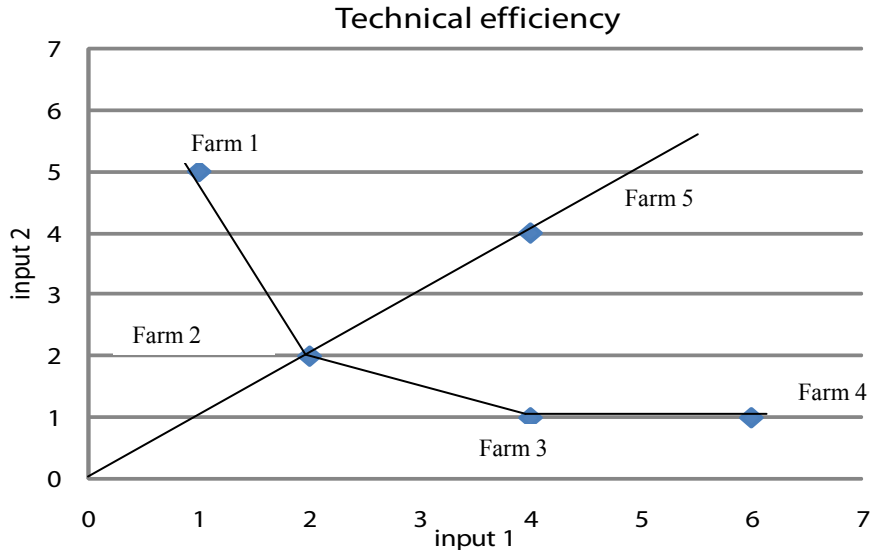
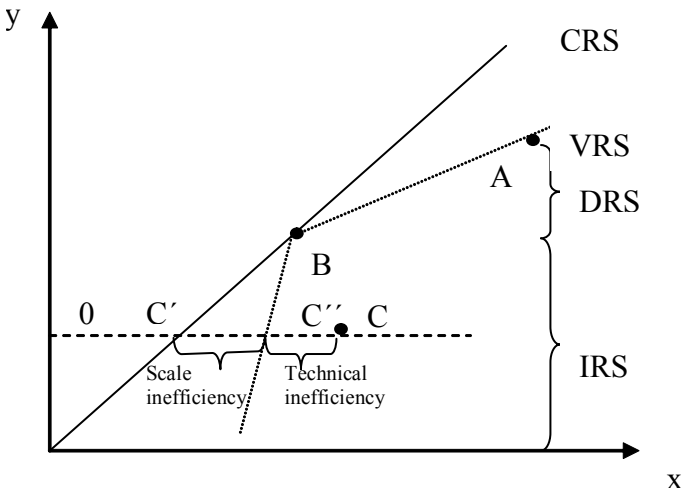


Figure 2. **One output and two input usage input-oriented model to achieve technical efficiency**

$$\lambda_j \geq 0 \qquad j = 1, 2, \ldots, n.$$

DEA can be used input or output oriented. In the input-oriented case DEA method defines the frontier by seeking the maximum possible proportional reduction in input usage, with output level holds constant, for each DMU. In the output oriented case, the DEA method seeks the maximum proportional increase in output production with input levels held fixed. The two measures provide the same technical efficiency scores when a constant returns-to-scale (CRS) technology applies, but are unequal when variable return-to-scale (VRS) is assumed. In that analysis we use both CRS and VRS technologies to measure the technical efficiency (TE), pure technical efficiency (PTE), and scale efficiency (SE) scores. From three different farms (A, B, C) only farm B is operating at efficient size as it touches the CRS-ray (Figure 3). Farm A lies on the VRS-frontier but not on the CRS-frontier and represents therefore only pure technical efficiency but not scale efficiency (Hambrusch et. al. 2006).

The IRS indicates that farm C should produce more outputs, DRS indicates that farm A should produce less outputs, shown in Figure 3 (Löthgren et. al. 1996). Note that efficiency measures, total technical efficiency, pure technical efficiency, scale efficiency, and input slacks are estimated using the computer software DEAP Version 2.1 described in Coelli 1996.



Technical efficiency (TE) = $\frac{0C'}{0C}$

Pure technical efficiency (PTE) = $\frac{0C''}{0C}$

Scale efficiency = $\frac{TE}{PTE} = \frac{0C'}{0C}$

Figure 3. **Technical efficiency (TE) and pure technical efficiency (PTE)**

Data

Data Envelopment Analysis (DEA) is used to estimate technical efficiency. The present study applies the input-oriented model with a single output and five inputs by using the data from the Estonian Farm Accounting Data Network (FADN). The observations were made of Estonian grain farms in 2000-2006. The *Rural Economy Research Centre* collects data from 500 farms annually; those enterprises represent 6724 farms in Estonia. The present analysis involves grain producers (according to FADN type 13 - specialist cereals, oilseed and protein crops) with at least 75% of agricultural land utilised to produce cereals and oilseed crops for each farm.

For the purpose of analysis the agricultural producers were divided into four groups: growing area up to 100 hectares; 101-200 hectares; 201-300 hectares and the agricultural producers, whose land in usage is larger than 301 hectares. The average parameters of enterprises are shown according to size groups during the years. To calculate the costs, all the input prices have been corrected with price index concerning the basic year (2000), for granted were taken purchase price indexes of Estonian Statistics Department for agricultural production. It was important to take into consideration the price indices, so as to avoid the bias of inflation in the analysis, and to give the adequate information about enlarged fertilisers' quantities of plants cultivation companies.

In the study we used one factor as output and five factors as inputs, those are chosen because all of them are important to grain producers – production, land, labour and costs. Monetary values of variables were adjusted downward to the year 2000 values by the index of agricultural input prices. Details of these variables are described below.

Output variable

- In the input-oriented model the single output variable was the total output in tons (t). The cereals and oilseed crops production are summarised in tons.

Input variable

- Land: this variable includes utilised agricultural area. We have not considered fallow and the land of forest.
- Labour: labour is in the form of annual work units. It includes all labour - paid and unpaid, which has contributed to work on the farm during the accounting year.
- Capital costs: capital costs included depreciation, interests, buildings and machinery maintenance, and insurance costs.
- Fertiliser and crop protection costs: includes costs for fertilisers and crop protection.
- Variable costs: includes cost for salary, rent, fuel, electricity, water etc. Variable costs include everything that is not considered in capital costs and fertiliser and crop protection costs.

The average arable area in all size groups was relative stable during the analysed years. It shows that the companies of plants cultivation were stable and there were no great changes in land usage during the last years. Only the average arable area in the group up to 100 hectares has grown up from 56 hectares to 77 hectares (37 %).

The average production volume in size groups was varying during 2000 – 2006. Due to higher yields the largest production was in 2005. For instance, the reason for lower production in 2006 was the rainless and hot summer, when the middle temperatures per month were from April to October higher as usually, the rainfall was during the plant cultivation period vastly less (Jõgeva Sordiaretuse Instituut).

Due to the EU and other agricultural supports the capital costs grew during the past years. The increase of capital costs is the definitive mark by supports given the agricultural producers the opportunity to make big investments to obtain competitive potential in agricultural sector and to be a competitor to agricultural producers in the old EU member states. The capital investments, effected by supports, have grown during the analysed period. From 2000-2006 the capital costs in 100 hectares companies grew by 46% and over 300 hectares companies by 84% compared to the year 2000. Too fast growth of capital costs refers that the earlier main assets were depreciated and it needed fast replace, that in turn caused great interest and collateral loan burdens for companies.

The use of fertilisers and pesticides during the analysed period has grown up in all size groups. For instance, since 2003 the usage of mineral fertilisers (N, P, K) in active substance has grown from 39 000 tons to 42 278 tons in 2006, at the same time the area of fertilised soil grew from 340 000 hectares up to 493 416 hectares, but the usage of fertilisers per ha has decreased from 117 kg down to 86 kg. (Statistikaamet 2005, 2008). Balance of nutrients has been negative during many years in Estonian soils, and there have been no problems of over fertilisation being the problem in many old EU states.

The other costs during 2000 – 2006 in all size groups have been very variable. As the other costs contain hired labour, the changes in the mentioned costs may be caused by conversion of enterprises capital intension. The fact asserts the decrease of annual working time. By analysing the usage of labour power according to hectare, it appears that the enterprises with larger capital costs and capital intensity are not so labour-intensive.

Table 1

The average input and output series depending on the size of farm

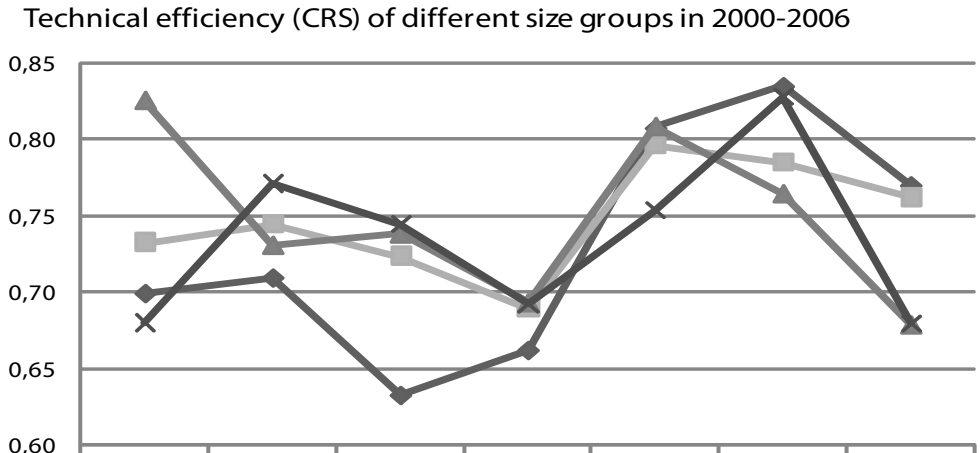
Average	Size, ha	2000	2001	2002	2003	2004	2005	2006
Land, ha	<100	56	60	57	63	69	69	77
	101−200	133	146	146	154	155	141	139
	201−300	235	237	246	245	244	241	242
	>301	507	458	417	475	460	510	494
Total output, t	<100	109	123	109	124	153	165	143
	101−200	257	308	329	315	306	338	298
	201−300	441	447	518	472	486	605	444
	>301	1062	995	929	898	898	1202	922
Labour, h	<100	3107	3078	3097	3257	2794	2924	2794
	101−200	4101	4243	4836	4725	5269	4390	3802
	201−300	7344	5376	5178	5120	4734	5080	4568
	>301	19051	12530	10617	10590	9498	8763	8050
Capital costs, EUR	<100	3532	2590	4022	3811	3920	3742	5192
	101−200	7263	8074	11206	12889	12373	9897	12051
	201−300	9773	11215	13786	17460	16751	18297	17645
	>301	21597	21264	26330	33254	30341	35691	39886
Fertilizer and crop protection	<100	3201	3919	3949	3484	4927	4396	4576
	101−200	7417	10650	12182	10571	10968	10816	12719
	201−300	10192	14696	20315	19936	19277	19945	22236
costs, EUR	>301	34200	38743	37447	35277	36480	41838	45387
Variable costs, EUR	<100	9398	8087	6273	7870	8830	7826	7788
	101−200	16757	17488	17639	16564	23416	18549	17539
	201−300	27303	24469	23124	26566	25324	37665	24722
	>301	86948	65537	57301	54167	56844	63828	57352
Number of farms	<100	38	38	40	29	25	16	14
	101−200	28	27	30	24	22	27	21
	201−300	9	11	10	18	16	9	19
	>301	6	10	12	14	17	20	18
Total	568	81	86	92	85	80	72	72

Results

The analysis of average technical efficiency of size groups revealed that in 2000 the producers with 201-300 hectares were most efficient, but in 2006 their efficiency were lower and the most efficient were producers of size group up to 100 hectares and also the producers group of 101 – 200 hectares. The lower efficiency of two larger groups may be caused by lower harvest in 2006 that affected larger companies, as the costs shall be covered with revenues, but in the mentioned year it was lower than the expected value (Figure 4).

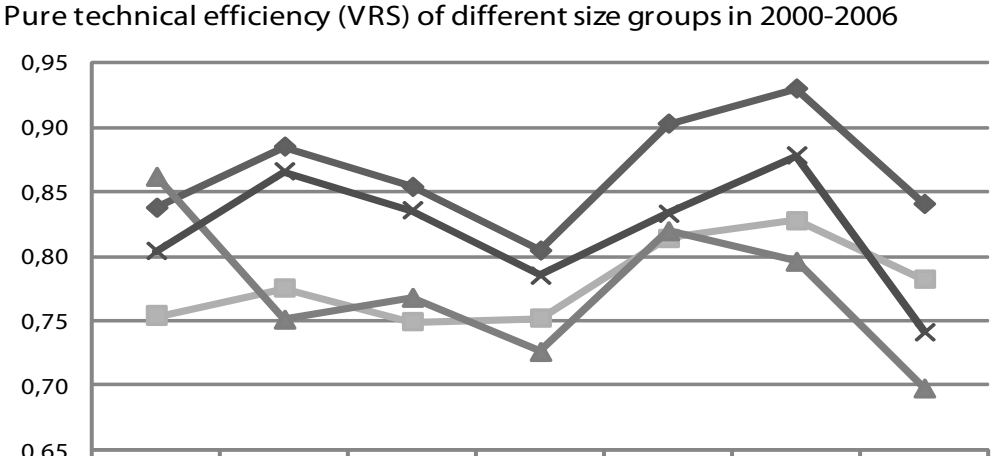
The average pure technical efficiency was relatively high for producers with up to 100 hectares (Figure 5). The lower efficiency of two larger groups may be again caused by lower harvest in 2006.

In 2000 the returns to scale were constant for 26% of all producers, 44% had increasing returns to scale and 30% decreasing returns to scale. In 2006 the figures are as follows: 18% of all producers had constant, 50% increasing returns to scale and 32% decreasing returns to scale, i.e., 50% would be more efficient by growth and 32% of companies are too



	2000	2001	2002	2003	2004	2005	2006
–100	0,70	0,71	0,63	0,66	0,81	0,83	0,77
101–200	0,73	0,74	0,72	0,69	0,80	0,79	0,76
201–300	0,83	0,73	0,74	0,69	0,81	0,76	0,68
301–	0,68	0,77	0,74	0,69	0,75	0,83	0,68

Figure 4. **Technical efficiency (CRS) of grain farms in different size groups in 2000-2006**



	2000	2001	2002	2003	2004	2005	2006
–100	0,84	0,88	0,85	0,80	0,90	0,93	0,84
101–200	0,75	0,78	0,75	0,75	0,81	0,83	0,78
201–300	0,86	0,75	0,77	0,73	0,82	0,80	0,70
301–	0,80	0,87	0,84	0,79	0,83	0,88	0,74

Figure 5. **Technical efficiency (VRS) of grain farms in different size groups in 2000-2006**

large and reducing production they would be more efficient. Scale efficiency was higher during all years in average producers, i. e., 100 – 300 hectares size group, the smaller and larger producers had lower scale efficiency during all years (Figure 6). It means that the producers up to 100 hectares and over 300 hectares have larger opportunities to increase efficiency by optimal resources and land use.

Conclusions

In production type of arable farms the weather is the greatest risk factor– fair weather, moistness, temperature differences, etc., all those factors affect the production volume and through this the technical efficiency of producers. According to the production decisions, the financial costs shall be calculated in spring, but the autumn harvest depends

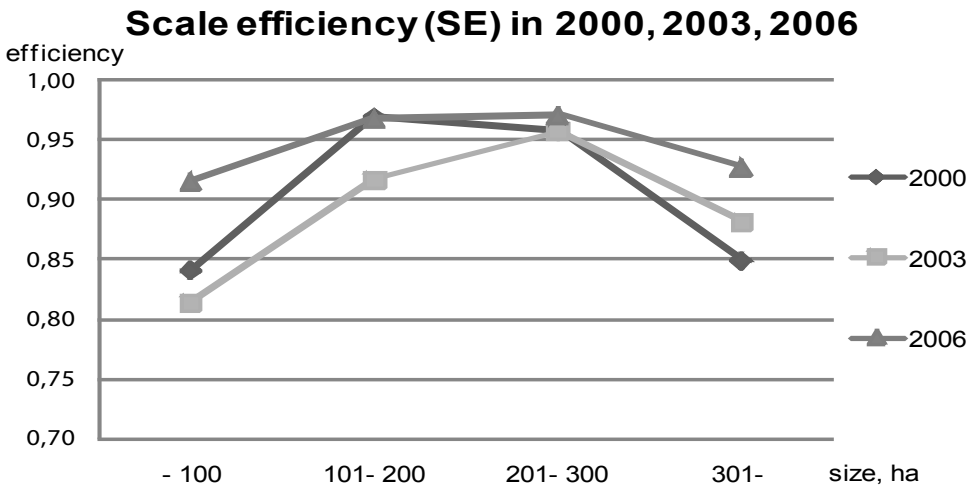


Figure 6. **Grain farms scale efficiency in 2000, 2003, 2006**

on the weather conditions. To have competitive production the agricultural producers have to do great investments both in available funds and machinery and buildings, which costs shall be covered by production revenues. All investments are done in hope to increase the competitiveness of the company and agricultural segment as well. The amount of investments - this is the permanent question bothering agricultural producers. The right decisions are the most important components to achieve technical effectiveness.

In conclusion, efficient can be agricultural producers with 100 hectares as those with 300 hectares, if they use the resources effectively or optimally. In 2000 technical and pure technical efficiency were highest in companies with 201 – 300 hectares, the opposite situation was in 2006, when the efficiency of this group was the lowest, it can be concluded that the year (weather) affected the most this group. The lower harvest in 2006 caused by fair weather and growth of capital costs caused to the companies with 201 – 300 hectares and over 300 hectares further difficulties, therefore meaning that the growers of grain and rape seed in the mentioned groups are most endangered and sensitive against the unpredictable situations.

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Factors Influencing Productivity of Cereals in Polish Agriculture

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Abstract

The aim of the paper is to evaluate the relative importance of the selected inputs for cereals yields in Poland. The official statistics of the Central Statistical Office of Poland is used for the analysis. The following data types have been used for the study: inputs of artificial fertilisers per hectare, consumption of pesticides per hectare, certified seed inputs per hectare and average soil quality. All data were collected on the province level for the period from 1991 to 2007.

The patterns of the source of productivity were investigated using two methods: interpretation of estimated parameters in Cobb-Douglas production function, and the analysis of squared semi partial correlations. The results applied in the research are similar from both methods. The paper argues that the least "pure impact" is connected with certified seeds, medium impact on chemical originated inputs (fertilisers and pesticides), and the largest impact - to soil quality. The findings of the study indicate that:

- pure impact of "certified seeds" is below 10%,
- impact of chemical origin inputs is ca. 30% - (influence of pesticides and artificial fertilisers are not to be separated (as they strongly depend on each other),
- pure impact of "soil quality" – about 60%.

The era with governing biological progress for the increase of has not yet begun in Polish agriculture. The inputs fertilisers and pesticides are still more important for the growth of productivity. Similar situation was observed in the developed countries as the USA or Germany in the 1970s.

Key words: technical progress, biological progress, cereals production in Poland, Cobb-Douglas function, squared semi partial correlations method.

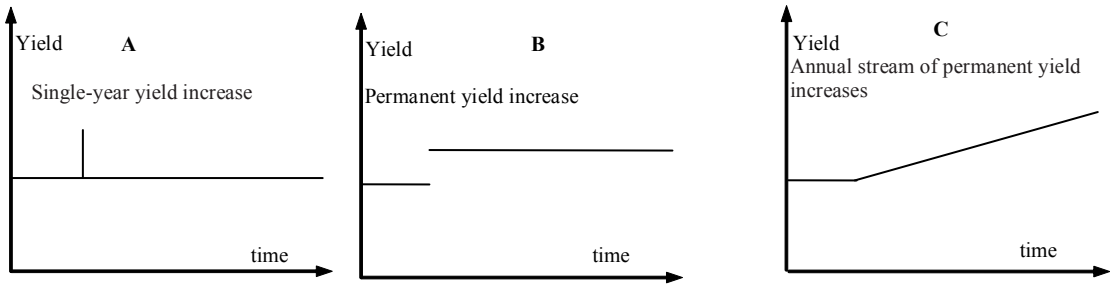
Introduction

Technological progress makes it possible to obtain an increase of productivity of production factors and lower unit manufacturing costs (Esposti 2000). Technological progress is the main factor leading to the increase of productivity also in agriculture. Not always, on the conditions of flexible demand and in case of innovation resulting in the increase of production and the increase of total costs, the growth of the manufacturer's income takes place, so the implementation of technological progress does not have to result in benefits at the level of a single enterprise. This group of innovations includes innovations of biological character (Heady 1967).

The most significant factors allowing the increase of productivity in agriculture include the implementation of biological progress. In a long-term perspective (1930-2000), thanks to biological progress it was possible to obtain about 50% of the detected increase of plant productivity (Duvick 2005; Lorgeou 2004; Nalborczyk 1997; Woś 1995, Thirtle 1995). It was more than the impact of such factors as: fertilisation, plant chemical protection, and mechanisation of production processes.

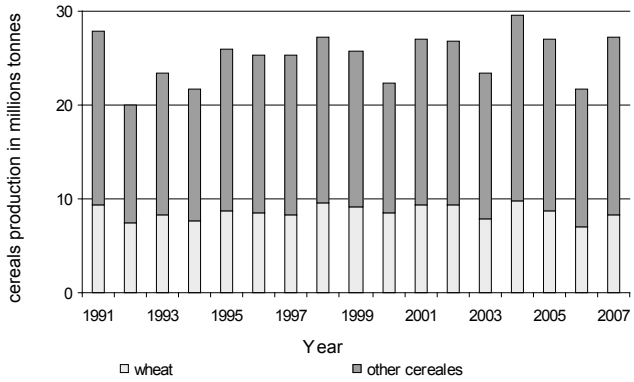
The significance of biological progress is greater than of other outlays, because the effect of their implementation remains in a period longer than one season (Figure 1). Outlays in form of fertilisers, plant protection agents, or even more diligent care entail a one-time increase of crops only (A). Improved varieties allow a rapid and permanent increase of the level of crops (B). A continuous inflow of improvements entails the continuous long-term increase of productivity (C) (Day-Rubenstein et al. 2005). Technological improvements have a similar effect.

Biological progress affects not only quantity, but also quality of products, allows energy savings in various forms; it is characterised by a short payback period, it semi neutral in relation to scale, however a high level of production technology is indispensable in order to reveal its effects. The results of application of this kind of progress are much delayed in the whole agriculture in relation to its first application (Tomczak 2005; Runowski 1997; Klepacki 1997; Reisch, Zeddies 1995; Herer 1970, Heady 1967).



Źródło: (Day-Rubenstein et al. 2005).

Figure 1. **Alternative assumptions about benefits from genetic enhancement**



Source: Figure drawn based on statistical data from CSO of Poland.

Figure 2. **Cereals production in Poland in the period of 1991-2007 (million tons)**

Most important factors determining the application of new varieties in production, and the use of their potential are as follows: information on varieties, availability of varieties, availability of seeds as well as the adaptability of varieties to local conditions and their applicability on certain agroecological conditions (Evenson 1994).

The following barriers to the increase of productivity exist due to the introduction of biological progress: need to increase outlays for fertilisers with plant protection, necessity to apply the correct technology, and a lack of appropriate knowledge of farmers (Day, Klotz-Ingram 1997). On the conditions of unfavourable outlay versus product price relations, and in the event of limitations resulting from manufacturing technologies of low intensity, the introduction of progress is not profitable (Wicki 2007).

The research results show that production potential of new varieties in Poland is applied on an insignificant scale on the account of a low use of certified seeds (Krzymuski 2003), inappropriate technology (Wicki, Dudek 2005), and also a high level of poor soils, on which the maximum yield does not exceed 2.5-3 tons/ha (Krasowicz 2007).

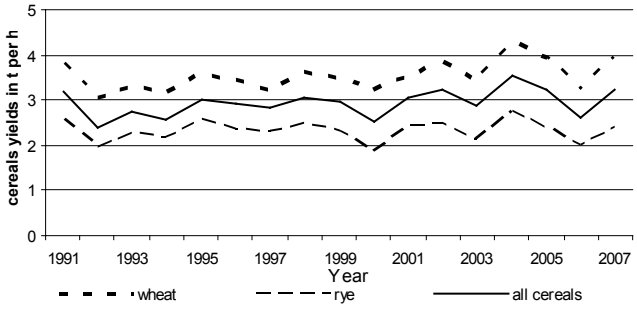
Cereals production in Poland

Cereals production in Poland is about 27 million of tons annually, and is subject to significant fluctuations as a result of changeable weather conditions (Figure 2). Droughts happening every few years negatively affect crops.

The observed small increase of the cereals production was mainly the result of an increase of the arable surface versus the stagnation of the crops level. Cereal yields in Poland have not significantly risen since 1991, and oscillate around 3 tons per hectare (Figure 3).

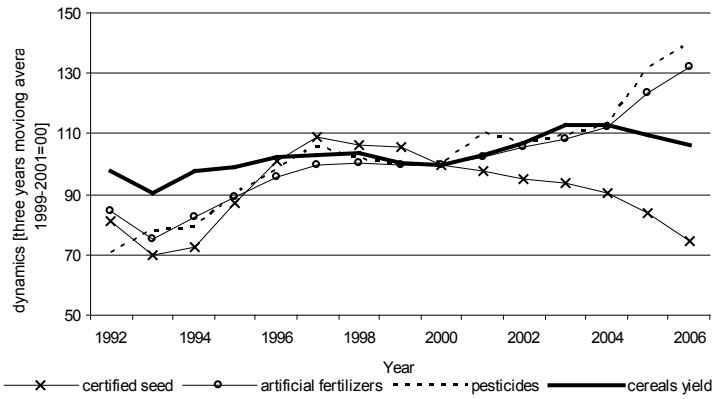
Consumption of seeds, fertilisers and pesticides

The level of mineral fertilisers, the quantity of applied pesticides and changes in the consumption of certified seeds are illustrated in Figure 4. Certified seeds of cereals constituted in the general consumption of the seed only from 5% in case of rye to 15% in case of wheat and barley. By comparison, in Spain it was respectively 17% in case of barley and 22% in case of wheat (Villarroel 2007), in France from 50% to 70% (Roger, Palle 2007), and in the USA in 1997 – 37% in case of wheat (Fernandez-Cornejo 2004).



Source. Figure made based on the data of CSO of Poland.

Figure 3. **Cereals yields in Poland in the period of 1991-2007**



Source: author's calculations based on the CSO of Poland data.

Figure 4. **Dynamics of cereals yield and selected inputs in Polish agriculture in 1991-2007 (based on three year moving average)**

Since 1992 the level of mineral fertilisers has grown from the level of 65 kg NPK/ha to 121 kg NPK/ha in 2007. Consumption of pesticides has increased significantly. On average, about 0.4 kg of active substance per 1 ha of cultivation was applied in Poland, and there was observed a continuous increase of pesticides consumption. In 2007 pesticides consumption was about 0.9 kg of active substance per 1 ha.

Figure 4 illustrates the dynamics of consumption of basic crop-generation outlays: certified seeds, artificial fertilisers and pesticides in Polish agriculture in relation to the obtained cereal yield. The observed increase in crops was attained thanks to a significant increase of outlays for artificial fertilisers and pesticides; at the same time decreasing the consumption of certified seeds.

The aim of research and the methods

The aim of the paper is to evaluate the relative importance of the selected inputs for cereals yields in Poland. The first task of the research is to evaluate the relative influence of inputs of certified seeds, fertilisers, pesticides and soil quality on cereals yield, and the second one is to find whether the factors chosen to analysis describe well enough cereals yield variability.

The official statistics of the Central Statistical Office of Poland (CSO) as well as the Inspectorate of Plant Health and Seed Inspection (PIORiN) and Research Centre for Cultivar Testing (COBORU) were used in the analysis. Soil classification for the provinces in Poland was based on Witek (1981). The maximum possible score is 100 points and the minimum observed in Poland is 19 points for some mountain regions.

The following data types have been used for the study: inputs of artificial fertilisers per hectare, consumption of pesticides per hectare, certified seed inputs per hectare, and the average soil quality. All data were collected on the province level for the period of 1991-2007.

The use of agricultural inputs is important to boost agricultural productivity, and to mitigate the

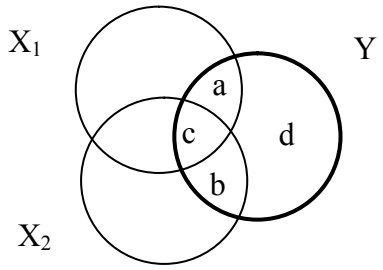


Figure 5. **Graphical relationship between the coefficient of determination and the squared semipartial correlations**

risk of a bad harvest. Agricultural inputs such as certified seeds, chemical fertilisers and pesticides enhance the quality and growth of crops. The Cobb-Douglas production function and squared semipartial correlations approaches are applied to find the influence of factors of production on yield.

The relevance of pesticides and fertilisers to agricultural productivity has become a stylised fact in developing economies. Fertilisers are one of the most enhancing productivity agricultural inputs in the agricultural economy. The authors as Hayami et al (1970), Headley (1968) and Carrasco and Moffit (1992) have found that fertilisers have an economically and statistically significant influence on agricultural productivity.

Parameters of model panel data was used for the estimation: information on the yield of cereals, certified seeds chemical fertilisers, pesticides use for each voivodship (province) over time.

Semipartial correlations are analysed for assessing the relative "importance" of various factors in determining dependent variable. They show how much each variable uniquely contributes to R^2 over and above that which can be accounted for by the other variables (Meyers, Gamst, Guarino 2006). To better understand the meaning of squared semipartial correlations, it will be helpful to consider Figure 5. In this figure, the variance of each variable is represented by a circle of unit area (i.e., each variable is standardised to have a variance of 1). Hence, $a+b+c+d=S_y^2=1$.

The total area of Y covered by the X_1 and X_2 areas represents the proportion of Y's variance accounted for by the two variables. The figure shows that this area is equal to the sum of the areas designated *a*, *b*, and *c*. The coefficient of determination in model with X_1 and X_2 can be expressed in the following form: $R_{12}^2=a+b+c$, whereas the coefficient of determination in model is equal with only X_1: $R_1^2=a+c$ and the coefficient of determination in model with only X_2 $R_2^2=b+c$

The areas *a* and *b* represent those portions of Y overlapped uniquely by X_1 and X_2, respectively, whereas area *c* represents their simultaneous overlap with Y. The "unique" areas, expressed as proportions of Y variance, are squared semipartial correlation coefficients, and each equals to the increase in the squared multiple correlation which occurs when the variable is added to the other independent variable. Thus, squared semipartial correlation coefficient $semiR_1^2$ is equal to a and $semiR_2^2=b$.

For the computational purposes one can apply the following formulae:

– for two independent variables: $semiR_1^2=R_{12}^2-R_2^2$ and $semiR_2^2=R_{12}^2-R_1^2$;
– for three independent variables: $semiR_1^2=R_{123}^2-R_{23}^2$, $semiR_2^2=R_{123}^2-R_{13}^2$ and $semiR_3^2=R_{123}^2-R_{12}^2$, and so on.

In the literature, the Cobb-Douglas specification is commonly used for the production function for ease estimation and clear interpretation of the parameters (Headley, 1968; Carrasco-Tauber and Moffit, 1992; Babcock *et al*., 1992; Carpentier and Weaver, 1997; Saha *et al*., 1997). In such case the model has the following form:

$$y_{it}=\beta_0 x_{1it}^{\beta_1} x_{2it}^{\beta_2} x_{3it}^{\beta_3} x_{4it}^{\beta_4} \xi_{it}$$

where:

y_{it} - yield of cereals,

β_0, β_1, β_2, β_3, β_4 - parameters,

x_{jit} - explanatory characteristics, j=1, 2,..,p:

x_{1it} - certified seeds,

x_{2it} - chemical fertilisers,

x_{3it} - pesticides,

x_{4i} - soil quality (this input is fixed over time),

ξ_{it} -random error, $\xi_{it} \approx i.i.d.\ (0,\sigma_\xi^2)$,

i indexes voivodshipds, *t* indexes years, i = 1, …, n, t = 1, …, T. In our study n=16, T=17 (data from years 1991-2007) and number of explanatory variables p=4.

In the Cobb-Douglas specification parameter β_j is partial elasticity of production with respect to each input X_j, j=1, 2, 3, 4, as $E_j = \frac{\%\Delta y}{\%\Delta x_j} = \frac{\partial y}{\partial x_j}\frac{x_j}{y} = \beta_j$.

Partial elasticity of production can be interpreted as the percentage change in output resulting from a given percentage change in the amount of the variable input X_j employed in the production process with other inputs remaining constant.

The Cobb-Douglas function is a special class of homogeneous production functions. A production function is homogeneous if, when all inputs are increased by a factor of *k,* the output increases by a factor k^r of where *r* is termed the degree of homogeneity. If a production function is homogeneous of degree *r*, the following relationship shall be hold:

$$f(k \cdot X_1, k \cdot X_2, .., k \cdot X_p) = k^r \cdot f(X_1, X_2, .., X_p) .$$

The *r* determines how much the output changes with a change of scale. Thus, the returns to scale are increasing, constant, or decreasing as *r >1, r=1, r < 1*. In other words, if all inputs are increased by the factor *k*, then output may either increase more than *k*, less than *k*, or increase by exactly the factor *k* . It can be shown that the Cobb-Douglas production function $f(X_1, X_2, .., X_p) = \beta_0 X_1^{\beta_1} X_2^{\beta_2} \ldots X_p^{\beta_p}$ is homogeneous of degree $r = \sum_{j'1}^{p} \beta_j$. Thus, the Cobb-Douglas production function exhibits increasing, constant, or decreasing returns to scale depending on whether $\sum_{j'1}^{p} \beta_j > 1$, $\sum_{j'1}^{p} \beta_j = 1$, $\sum_{j'1}^{p} \beta_j < 1$. The analysis of estimated values of $\beta_1, \beta_2, \ldots, \beta_p$ enables assessment of relative impact of each input. In order to compute the share of individual input in returns to scale one can also consider $\frac{\beta_1}{\sum_{j'1}^{p} \beta_j}$, $\frac{\beta_2}{\sum_{j'1}^{p} \beta_j}, \ldots, \frac{\beta_p}{\sum_{j'1}^{p} \beta_j}$.

The following Cobb-Douglas function in a log-linear form is considered: $\ln y_{it} = \alpha + \sum_{j=1}^{k} \beta_j \ln x_{jit} + \varepsilon_{it}$, where ε -random error. This approach facilitates the estimation of parameters[1].

The panel data methods are used in the research. Panel data analysis endows the regression analysis with both a spatial and temporal dimension. The spatial dimension pertains to a set of cross-sectional units of observation. The temporal dimension pertains to periodic observations of a set of variables characterising these cross-sectional units over a particular time span. We have a set of explanatory variables and a dependent variable both observed for a number of cross-sectional units i = 1, …, n and through time t = 1, …, T.

There are three basic types of static panel data models: pooled regression, fixed effect and random effect models (Baltagi 2001; Greene 2000; Wooldridge 2002). The choice between the specifications of the model is an important aspect of panel econometrics. There are three basic tests for comparison of models. Fixed effects versus pooled regressions are tested by the F-test, while random effects versus pooled regressions are tested by the Breusch-Pagan test. The Hausman specification test is the classical test to show the use of either the fixed or random effects model.

Results

First, models based on the "rough" data from individual years from the period of 1991-2007 were considered. However, in such case, the hypothesis of normal distribution of the error term was rejected. Moreover, the estimated goodness of fit by looking at the coefficient of determination was not very good - $R^2 \approx 0,50$. Next "smooth data" - simple moving averages for five years period was taken into account. This method reduces the impact of anomalies associated with climatic changes, like flood or *drought.* For such "smooth data" pooled regression, fixed effect, and random effect models are estimated. Several tests, such as the Breusch-Pagan test, Hausman specification test and the F-test, were employed to choose the most appropriated model (Baltagi 2001, Greene 2000). The results of comparison between the models are presented in Table 1.

The panel diagnostic tests suggest that the fixed effect model is the most appropriate. However "soil quality" is time-invariant characteristics, thus a typical fixed effect specification cannot be applied. Econometric textbooks typically recommend the Hausman-Taylor procedure for panel data with time-invariant variables and correlated unit effects (Baltagi 2001). The Hausman-Taylor estimator requires several conditions in order to be implemented

[1] Taking logs transforms the non-linear model into linear one in respect to parameters.

Table 1

The results of panel diagnostics tests

Result:	F-test	Breusch-Pagan test	Hausman test
Value of statistics	74.62	712.99	26.73
P-value	less than 0.001	less than 0.001	less than 0.001

Source: authors' calculations obtained by using Gretl software, the F. Breusch-Pagan and Hausman tests are panel diagnostic tests. .

Table 2

Values of Pearson correlations for the analysed variables

Variables:	lny	$\ln x_1$	$\ln x_2$	$\ln x_3$	$\ln x_4$
lny	1	0.45	0.64	0.50	0.57
$\ln x_1$	0.45	1	0.50	0.39	0.08
$\ln x_2$	0.64	0.50	1	**0.90**	0.06
$\ln x_3$	0.50	0.39	**0.90**	1	-0.03
$\ln x_4$	0.57	0.08	0.06	-0.03	1

Source: authors' calculations. x_1 - certified seeds, x_2 - chemical fertilisers, x_3 - pesticides, x_4 - soil quality.

effectively. First, the unobserved cross-sectional level effect must indeed be random, i.e., it has a zero mean, finite variance, and is independently and identically distributed over the cross-section units. Second, one needs to classify our explanatory variables into four types: time-varying and exogenous, time-varying and endogenous, time-invariant and exogenous, and time-invariant and endogenous. Fulfilment of these conditions is a formidable task especially since the unit effects are unobserved, thus finally we decided to apply a pooled regression model.

As "chemical fertilisers" and "pesticides" (Table 2) are highly correlated, these two variables should not be included together as explanatory variables due to the multicollinearity. One of the features of multicollinearity is that the standard errors of the affected coefficients tend to be large. In that case, the test of the hypothesis showing the coefficient equal to zero against the alternative where it is not equal to zero leads to a failure to reject the null hypothesis.

First, x_{2it} (chemical fertilisers) is dropped due to the multicollinearity.

$$\hat{\ln y}_{it} = \underset{(75,6190)^*}{3,35629} + \underset{(5,3200)^*}{0,0633}\ln x_{1it} + \underset{(9,3810)^*}{0,2099}\ln x_{3it} + \underset{(13,5080)^*}{0,6588}\ln x_{4it}$$

(Model 1)

The t-statistics are reported in the parenthesis, * denotes significant parameter at 0.05 level. Based upon Jarque-Berra statistics, we can not reject the hypothesis of normality of error term (JB=2.10[2], p-value=0.35). The values of squared semipartial correlations for each explanatory variable are reported in Table 2.

The coefficient of determination consists of two parts: the sum of squared semipartial correlations and the common part (a proportion of explanation coming from the combinations of explanatory variables). The difference between the coefficient of determination and the sum of squared semipartial correlations is about 13%, thus this part of total sum of squares of logarithms of yields of cereals is explained by the interaction of certified seeds, pesticides and soil quality. About 5% of total sum of squares of logarithms of yields of cereals refers to "pure impact" of logarithms of certified seeds, 15% of this sum - to logarithms of pesticides and 32% - to soil quality.
Taking into account only the sum of squared semipartial correlations one can state that near 10% of the sum of "pure effects" deals with certified seeds, near 30% of this sum deals with certified seeds and a little more than 60% - with soil quality (third row of Table 3).

One can compare this assessment with the result of estimation of the Cobb-Douglas parameters, which can be interpreted in terms of elasticity of production. This elasticity is defined as the average percentage change in production associated with a 1% increase

[3] JB indicates the Jarque-Berra statistics.

Table 3

Values of squared semipartial correlations in Model (1)

Certified seeds	Pesticides	Soil quality	Sum of squared semipartial correlations	Coefficient of determination
$semiR_1^2$ =4.92%	$semiR_3^2$ =15.28%	$semiR_4^2$ =31.68%	$\sum_j semiR_j^2$ =51.88%	R^2 =64.58%
$\frac{semiR_1^2}{\sum_j semiR_j^2}$ =9.47%	$\frac{semiR_3^2}{\sum_j semiR_j^2}$ =29.4%	$\frac{semiR_4^2}{\sum_j semiR_j^2}$ =61.07%	-	-

Source: authors' calculations obtained by using Gretl software

Table 4

Values of squared semipartial correlations in Model (2)

certified seeds	fertilizers NPK	soil quality	Sum of squared semipartial correlations	Coefficient of determination
$semiR_1^2$ =1.70%	$semiR_2^2$ =21.09%	$semiR_4^2$ =27.43%	$\sum_j semiR_j^2$ =50.22%	R^2 =70.38%
$\frac{semiR_1^2}{\sum_j semiR_j^2}$ =3.39%	$\frac{semiR_2^2}{\sum_j semiR_j^2}$ =41.99%	$\frac{semiR_4^2}{\sum_j semiR_j^2}$ =54.62%	-	-

Source: authors' calculations obtained by using Gretl software

in one input, with the other inputs held constant. The estimated parameters of model (1) can be interpreted in the following manner:

- If the application of certified seeds increases by 1%, and the use of pesticides and soil quantity is unchanged, the yields would increase by 0.06%. If certified seeds consumption increases by 1%, and other inputs do not change, increasing of cereals yield by 0.06% is expected.
- Given a 1% change in the use of pesticides, shows a 0.21% change in the yields of cereals, ceteris paribus.
- One percent improvement of soil quality leads to a 0.66% increase in the yields of cereals; while the use of certified seeds and pesticides are held constant.

It was found that the least "pure impact" refers to certified seeds, medium one to pesticides, and the largest - to soil quality. Therefore the approximated size of impact of inputs is close to that obtained by the analysis of squared semipartial correlations.

Next, a similar analysis was done replacing pesticides with chemical fertilisers. It *results in obtaining the following model:*

$$\widehat{\ln y}_{it} = \underset{(22,8440)^*}{2,0984} + \underset{(3,4230)^*}{0,0393}\ln x_{1it} + \underset{(12,0520)^*}{0,2751}\ln x_{2it} + \underset{(13,2320)^*}{0,6117}\ln x_{4it}$$

(Model 2)

The p-value of the Jarque-Berra test for normality is 0.52, thus one *cannot reject* the normality of residuals. For the above model we tried to asses the amount of input "impacts" on the yields of cereals in 1991-2007. The results are presented in Table 4.

In Model (2) the total sum of squares of logarithms of yields of cereals is explained in 70.38% by the logarithms of certified seeds, mineral fertilisers and soil quality. Decomposing the coefficient of determination into two parts, one can state that:

1) about 20% of the total sum of squares of logarithms of yields of cereals refers to the common effects of certified seeds, pesticides and soil quality,
2) about half of variance of the dependent variable is associated with each independent variable uniquely: about 2% with only logarithms of certified seeds, about 21% with logarithms of mineral fertilisers, and about 27% with logarithms of soil quality.

Taking into account the interpretation of estimated parameters in the Cobb-Douglas model one can conclude that:

- If the application of certified seeds increases by 1%, and the use of mineral fertilisers and soil quantity is unchanged, the yields would increase by about 0.04%. Precisely, if certified seeds consumption increases by 1%, and other inputs do not change, increasing of cereals yield by 0.04% is expected.
- Given a 1% change in the use of mineral fertilisers shows a 0.28% change in the yields of cereals, ceteris paribus.
- One percent improvement of soil quality leads to a 0.61% increase in the yields of cereals; while the use of certified seeds and mineral fertilisers are held constant.

Economies of scales are calculated as the sum of the estimated input elasticities: for Model (1) $\hat{\beta}_1 + \hat{\beta}_2 + \hat{\beta}_4 = 0{,}9319$ and for Model (2) $\hat{\beta}_1 + \hat{\beta}_3 + \hat{\beta}_4 = 0{,}9261$. They are slightly less than one, thus it is a case of decreasing returns to scale – outputs increase slower than inputs. From the economic point of view, only if there is a positive margin profit gained, it is economically efficient to increase the volume of inputs. Higher production intensity can be rational so long as it brings any marginal profit allowing to cover the fixed costs. The analysis of such factors as a scale of production needs to be additionally analysed in separate research for further conclusions.

Concluding remarks

The patterns of source of productivity were investigated via interpretation of estimated parameters in the Cobb-Douglas production function, and the analysis of squared semipartial correlations. The first approach relies on the interpretation of elasticity of production, which is defined as the average percentage change in production associated with a 1% increase in one input, with the other inputs held constant. The second method refers to decomposition of the coefficient of determination into the percent of variance in the dependent variable associated with each independent variable uniquely, and the proportion of explained variance associated with the common effects of predictors.

The results from both methods applied in the research are similar. The paper argues that the least "pure impact" is connected with certified seeds, medium impact with chemical originated inputs (fertilisers and pesticides) and the largest impact - with soil quality. The findings of the study indicate that:

- pure impact of "certified seeds" is below 10%,
- impact of chemical origin inputs is ca. 30% - (influence of pesticides and artificial fertilisers is not to be separated because they strongly depend on each other),
- pure impact of "soil quality" – about 60%.

It was found that the economies of scale are all less than one, thus it is a case of decreasing returns to scale – outputs increase slower than inputs:

Outlays for crop-generation factors of organic origin play the biggest role in Polish agriculture. Also the quality of soils used for production is important, which means that the further use of poor or light soils would be a significant factor delimiting the increase of crops. The significance of biological progress has been determined as less than 10% of the total impact of the examined factors. It means that, on average, the productivity potential of new varieties is not used, as according to the results of tests run in the research institutes, new varieties are characterised by a significantly higher potential of the crop yield. It may be the result of limitations related to a low quality of soils as well as insufficient outlays for fertilisers and pesticides. Polish agriculture seems to be on average at such a level of development which was observed in the Western European countries in the 1970s and 1980s of the 20th century. There is a big number of establishments at a very high level of technology, but on the contrary there are farms of traditional and hardly modern techniques of farming. Changes in the effectiveness of plant production can take place slowly, because they require a social re-construction in Polish agriculture. Moreover, the increase of effectiveness in the crops production will require the abandonment of the agricultural use of the poorest soils constituting about 30% of the surface of arable lands in Poland.

Only after attaining the appropriate technological level and abandonment of the poorest soils it will be possible to use the crop-generation potential of new

varieties in the whole-agricultural sector, and not only in a small number of the best farms.

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Modern Marketing Tools in Traditional Ecological Farms

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Abstract
The ecological farm bases on traditional methods of production with the use of only organic and natural ways of taking care about the plants with manure. The natural ways are also used in feeding the animals. The whole production cycle is done in a closed circuit. The use of traditional production methods does not mean that organisation and management is also traditional. Ecological farms appeared in Poland as a competitive response against high-profitable farms of the Western Europe. This fight could not be won with only ecological product. To win the competition it must be properly visible in the market as well as final consumer group shall be found. In article the author presents the relationship between modern marketing techniques and traditional production methods in farms of the West Pomerania. This relation provides support in competition with other national and foreign products.
Key words: marketing tools, traditional ecological farms, competitiveness.

Introduction
The ecological farming is a very dynamic part of economy in the world. Poland also follows this direction. The factors that are positive for growth of ecological production in Poland are as follows: quite low level of dirtiness of natural environment, traditional technologies in production, and huge human resources in Polish village. Additionally the rural products that come from ecological methods of farming serve as guarantee of safe food. At the same time, ecological production allows keeping the natural environment in not changed state (Runowski H., 2004).

However, there are still serious dangers for creation of proper conditions for further grow of ecological farms in Poland. Two main threaten factors can be distinguished. The first comes from constantly increasing amount of ecological farms. For example, in 2002 there were around 2000 and in 2007 over 10000 ecological farms (Komorowska D., 2006). The second factor is a constant demand for ecological products in Polish society resulting from high price of products and high costs of production. This causes an increase of competition between farms, both ecological and traditional ones. Still the researches continue in respect of tools allowing companies to keep alive on more demanding market.

It is urgent to ask a question if it is possible to strengthen the market position of ecological farms, especially if they cannot implement modern methods of production and they cannot be competitive by using price.

The competition in getting consumers and getting dominance in the market can be done by:
- implementation of oriented marketing (orientation on customer satisfaction);
- usage of these marketing tools that would not be in the opposition to ecological conditions.

According to Altkom (Alktom J, 1999) marketing allows proper identification and creation of the position of company in the market. Marketing rules are pushing to "think before action". Additionally the rule of using the compact marketing tools is a way of coordinated action with the usage of all the necessary, in particular situation, methods.

The purpose and method
The purpose of the paper is to defend the above thesis, from which it can be seen, that the fight to get customers and getting the dominance in competition in Polish market by ecological farms can be done using the marketing tools, which would not destroy ecological conditions of production. Based on the mentioned the analysis of main marketing tools used to strengthen the position of ecological farms in producers and delivery market was performed. According to PH. Kotler, such tools include product, price, promotion, and distribution (Kotler P, 2000) There is a need to prove that development of ecological farms must go together with the change of orientation of farms. The change shall lead from producer (dominant in Poland) to orientation on the market and final customer.

Consequently the very important task in this situation in being competitive on market is the

creation of tools that would allow using competitive dominance. Only this will allow surviving of the company (Drucker P.F., 1992). There are useful marketing tools like market research, implementation of new products and technologies, modern forms of selling. They will allow getting the biggest possible part of market and consumer satisfaction

The 16 best Polish ecological farms (the one that got the highest part of market in years 1998-2007) were chosen to perform the mentioned above task. A pool, based on standardised interview with a questionnaire in e-form was performed for this task. The questions (both open and closed) were constructed in such way to receive answers on innovations in product, price, distribution and promotion. The competition in modern economy is conditioned in the majority by innovations in these scopes.

Results and Discussion

Characteristics of farms

Farms from 3 Polish regions: Lesser Poland (5), Subcarpathia (6), and Masovian (5) fell in the group of 16 ecological farms. The land size of farms is around 10 hectares. They are mostly specialised in farming or are producers of plants and animals. The dominant is farming of fodder (around 50%), followed by windrows (around 30%). In the structure of animals the biggest group specialises in cattle (over 50%), sheep and goats (around 20%) and flock (15%). In creation of production value, the biggest part is formed by milk and its products (around 20%), followed by vegetables (over 15%), windrows (around 10%), beef (10%), and pork (6%). Seasonally there are some fruits like strawberries.

The companies have positive economic results. They are definitely better than the average results in other farms of Poland (Table 1).

The chosen farms have higher gross and net surplus as well as higher supplements and income. The particular economic values allow positive analysis of the chosen companies.

Marketing forms of competition in the chosen companies

Competition between companies can be done in different ways. The one way is defined based on the current market and level of its perfection showing the level of perfection in competition (Szopiński W., Kuźniar W., 2008). The basic forms of competition used within the past 10 years are provided in Table 2.

The total amount of producers does not equal to 100% because the same farm could provide a positive answer for different options within the tool. For example, a company can have own storage place and use own transport to deliver it to a specialised sales point.

In the scope of product there are visible changes in way of providing the product to customer. For example:

a) ecological farms take care to provide proper information. The information contains info about specific values, for example, healthiness of product (40% of answers);
b) ecological products do not look slovenly. Six of sixteen companies clean, sort and pack the products.

Table 1

Average income of ecological farms in Poland and researched probe in 2007 [PLN/farm]

	Average income of ecological farms in Poland	Average income in the researched probe of 16 companies
Value of production	40 894	44 983
Production supplement	16 980	20 110
Value of production with supplement	57 874	65 093
Indirect usage	16 526	17 036
Depreciation	8 996	9 896
Surplus value - gross	25 763	42 284
Surplus value - net	16 560	31 589
Cost of external factors	2 045	2 022
Income from family company	23 559	32 025

Source: author's research based on pools and data from IERiGŻ (Nachtman G., 2007) and IJHARS

Table 2

Marketing tools used for competition in the chosen companies

Marketing tools	Measures:	Share of farms,% [16=100%]
Product	1. Own natural character shall be maintained to keep ecological advantage products; however they can be put into technological actions like cleaning, drying, and packing.	35
	2. Name of product shall be regional or/and traditional.	15
	3. Providing additional advantages like more information.	40
	4. Merging sold product with other (the so-called relational sales).	15
Price	1. Usage of lowered prices in time of higher collection.	65
	2. Price promotions for products with short term validity.	35
	3. Negotiated prices for permanent customers.	85
	4. Prices dependent on turnover.	80
Promotion	1. Usage of the newest technologies (like internet, own websites) for providing information about company and its products.	60
	2. Founding own, or providing financial support for organisations that propagate information about healthy food.	60
	3. Active participation in spreading information about healthy food (like conferences).	75
Distribution	1. Shorten the distribution chain by using direct sales.	15
	2. Creation of centralized sales points in big cities.	10
	3. Usage of own transport.	75
	4. Building and usage of own storage places or coolers.	80

Source: author's research based on the pools

c) some farms take care to get the certification "Traditional product" or "Regional product" (15% of answers);
d) usage of marketing tools, for example, by relation between product and promotion.

The price of products from ecological farms unfortunately is not low. It is hard to decrease price during production due to the necessity of hiring the people, which are much more expensive than machines itself. In the production phase there is no possible to use chemical products that reduce risk of losses. The only way of price manipulation is making the profit form increasing the turnover. This brings companies to the situation when they have to decrease prices for long-term customers (80-85% of answers) or use price decrease in high season time (65%).

The owners of ecological farms (11 of 16) use their own transport and open sell points (10%) to decrease price. The other way is to shorten distribution chain and usage of own coolers, shops and ways of selling (relatively 80 and 15%)

Of course, the most important marketing tool that allows checking the satisfaction of customers' requirements is promotion. In the research the author pays attention on the ways of promotion and communication with others.

Sixty per cent (10 on 16) of companies use all modern techniques (Internet, own WWWs, forums, chats) to provide information on a company and its products. It is very important to establish feed-back communication with customers. This way of communication allows not only presenting product but receiving the opinion about it as well. This allows doing faster modifications according to customer needs.

There is a need to pay a special attention on the fact that farms are interested in providing knowledge about companies and its products by creation of specialised organizations (60%). The owners of the best Polish ecological farms know that active participation in commercials, conferences, and presentations gives time planned results. They also know that it is important to teach the youngest people how to eat healthy (70%).

Summary

The most important ways of fight are determinants and competition tools in marketing

actions (Determinanty i instrumenty konkurowania w działaniach marketingowych 2008):

- special care about permanent recipients of products;
- taking care about direct contact with consumer (direct sell);
- increasing usage values with the same price;
- proper prices and sales conditions;
- decreasing amount of sub-sellers;
- unique offer and its high quality;
- intensive promotion;
- prestige of product;
- modern technologies.

It can easily be seen that the researched companies were using all the mentioned above ways of competition. Special care about permanent recipients is visible in special pricing of product as well as keeping eye on proper coverage with sufficient information about the value of ecological food. The care about consumer can be also seen in decreasing amount of resellers, and keeping direct contact with consumers. The wider description of this problem can be found in papers of Korelewska (Korelewska E., 2008) and Nestorowicz (Nestorowicz R., 2006) as well in the publication by group of Scientifics "New Aspects of Competition and Distribution of Ecological Products in Poland" (Nowe aspekty konkurencyjności …2008).

The new, very important element of competition is growing (however very slow) skill of co-operation, which is visible in having stores with ecological and healthy food (in the research only 2 owners have a common shop) as well as creation of long term contracts with producers of ecological food. The focus on this subject is described by Szeremeta and Jastrzębska (Szeremeta A., Jastrzębska D., 2006).

All companies take care about promotion of their products. Each of them has chosen at least one way of promotion. To get contact with wide group of consumer they are using in professional way the newest technologies in informatics. The special attention should be paid on the fact that companies are using funds oriented on support their production. The money is invested to increase the value of company.

Conclusions

All the analysed companies provide wide knowledge of modern marketing tools that are used in competition. The value of production of these 16 companies is constantly growing within 10 years. It means that direction which they have chosen is proper, and gives profit in hard economic reality. Despite traditional methods of production, ecological farms use modern methods of marketing and management. They use competently all marketing tools proposed by Kotler. Opening for marketing orientation allows companies implementing all economic plans and gives satisfaction in profit and customer satisfaction.

In future farms, to become competitive, shall be fully modern especially in aspect of marketing and organisation. At the same time they should keep traditional way of production.

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Economic Situation of Farms in Poland Oriented at Milk Production after the Accession to the European Union

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Abstract
The basic aim of the conducted research is to show the influence of the scale of production, measured with a size of a herd of cows on the productivity of the basic means of production (land, work, capital), and on the financial situation of farms orientated at milk production in Poland after accession to the European Union. Data concerning macroeconomic conditionings as well as data coming from farms running farm accountancy - Polish FADN (Farm Accountancy Data Network) in the years 2004- 2006, where dairy cattle was the dominating direction of production (TF41) or a prevailing one, were used for the analysis). Farms were grouped according to an annual average number of kept cows into the following groups: up to 10, 10-20, 20-40, 40-60 and above 60. The analysis of the milk orientated farms shows strong connections between the area of farms, employment as well as value of the property engaged at a farm. Together with the scale of production the share of fixed assets slightly decreases, while the level of indebtedness, especially long-term, increases. The investment possibilities of the farm also change. The dairy efficiency of cows shows a strong connection with the scale of production. Farms with the biggest scale of production obtain about 60% more milk from a cow per a year than farms keeping up to 10 cows. Productivity of the basic means of production (land, work and capital) depends heavily on the scale of production. It is especially observed in case of economic productivity of work, which at farms with the biggest scale of production is about 5-6 times higher than at farms with the smallest scale. On farms which keep over 60 cows the income was almost 18-times higher than on farms breeding up to 10 cows. The analysis of the production costs indicates that the most favourable level of costs is observed on farms keeping between 20 and 60 cows.
Key words: scale of production, farm assets, production costs, intensity and efficiency of production, income, work output.

1. Macroeconomic determinants of the milk market in Poland

Three years after accession to the EU the development of Polish economy was on the highest level taking into account the last decade. National demand, both investment and consumer, was rising, and the increase included all main economy sectors. In 2007 GDP has grown by 6.5%, and Poland was among the fastest developing countries in the European Union. Consumption was rising in a pace unseen in the earlier years. In 2007 the dynamics of individual consumption amounted to 5.2% in comparison with the 4.9% in 2006. This situation was favoured by a high increase in real wages and households` as well as farmers` income. The acceleration of the consumption was reflected in retail sales, which increased in 2007 in constant prices by 14.0% compared with 11.9% in 2006. In 2007 the sold industrial output has increased by 9.5% and food output by 7.3. In this context it is worth to observe that the global agricultural output in 2007 has grown by 6% in comparison with a decline by 9.5% in 2006. The plant production has also significantly risen by 9.2 % and the animal production by 3.0 %. Prices of the most basic plant products have increased on the agricultural market. Prices of milk and poultry have also grown notably, while the cattle and livestock became cheaper. “Price scissors” (price relations) of the agricultural products sold by the farmers in relation to the prices of goods and services purchased by them were shaped favourably. “Price scissors” index amounted to 106.5 while in 2006 it came to 102.0 and in 2005 to 96.0 (Smoleński Z., 2008). However, the economic stability faced threats of both internal and external nature. Limitations of development were caused by the growing costs of wages and a rise in prices of the investment goods as well as in prices of commodities and consumer services. In January 2008 its 12-month increase amounted to 7.3% in comparison with 3.3% in the proceeding year. Apart from the internal demand - supply factors the essential influence was caused by the situation in

the world markets, especially a growing consumption in the developing countries, such as China and India, and a growing demand for the oil plants and certain grains presented by the producers of bio-fuels.

Milk market is one of the most important farming markets in Poland. Its share in the country's farming market equals to 17% proving an enormous significance of this market. Milk production is considered as one of the most difficult branches of farming. The main reason for this is the high labour intensity and a continuous character of production together with the high quality and sanitary requirements. Adjustment process of the Polish dairy farms has lasted for many years now. Several different processes form the abovementioned one, among them being: process of concentration, process of technology modernisation, process aiming at improving the level of competitiveness and adjusting to the sanitary and veterinary standards as well as process concerning animal well-being and environment protection in relation to the EU requirements (Seremak-Bulge 2007; Świetlik, Seremak-Bulge J., 2005). Process of the production concentration significantly accelerated in the second half of the 1990s. Bigger quality demands towards the dairy farms as well as their active price policy and awarding top quality milk were the factors affecting this process most. This process was supported by the preferential credits for the restructuring a dairy branch. In the frame of the milk sector reorganisation in Poland between 1995 and 2005 the total amount of EUR 1.8 billion was invested (Seremak –Bulge J., 2007, Szajner P., Szczególska M., 2007). In comparison, milk production in 2007 (11 750 m. l) has fallen only slightly in relation to the year 1992 (12 770 m. l). At the same time a rise in the purchased milk was observed, from 6 854 m. l in 1992 to 8 326 m. l in 2007. The number of cows in this period has decreased considerably, from 4 257 thousand of heads in 1992 to 2 724 thousand of heads in 2007. It means that an average cow milk capacity in the studied period has grown. According to the Main Statistical Bureau in 1993 in Poland from one cow farmers obtained 3015 l of milk while in 2007 as much as 4300 l.

Poland's accession to the EU was related to the implementation of milk quota. In the years 2004 - 2008 there were substantial changes in the number of wholesale suppliers (suppliers who sell milk to collection points) and in the average milk quota obtained from a supplier. In a sample year 2004/ 2005 there were 314 0044 wholesale suppliers, and the milk quota per one supplier amounted to 26 066 kg. On the contrary in a sample year 2007/ 2008 there were 206 610 wholesale suppliers and the milk quota came to 44 459 kg per one supplier. Between 2004 and 2008 the number of suppliers has reduced by 104 thousand (33.6%) while the quantity of milk quota per one supplier has increased by 70.6%. These numbers show that after Poland's accession to the EU the process of milk concentration was getting stronger (Czakowska H., Czyżewski A., Sass R., 2008, Smoleński Z., 2008). A significant question arises as to how the changes in milk production concentration affected the economic situation of dairy farms in Poland.

In the light of this conditioning the basic aim of conducted research is to show the influence of the production scale measured with the size of the herd of cows on the means of production (land, work and capital) and financial situation of the farms oriented at milk production in Poland after accession to the European Union.

2. Source materials

The data concerning macroeconomic conditionings as well as data coming from farms running farm accountancy - Polish FADN (Farm Accountancy Data Network) in the years 2004- 2006, where dairy cattle was the dominating direction of production (TF41) or a prevailing one, were used for the analysis.[1] Farms were grouped according to an annual average number of kept cows into the following groups: up to 10, 10-20, 20-40, 40-60 and above 60. A farm rated among one group in 2004 was rated among the same in the following years regardless of whether they met the criteria required in 2004. This combination of data made it possible to be certain that the observed differences in years result from changes taking place in particular sub - groups, consisting of farms of the same kind, and not from the fact that another sub - group is analysed.

Taking into account the fact that an economic size of dairy farms strongly correlates with the number of kept cows, the analysis is based on a weighted average, thus allowing relating the achieved results to all farms over 2 ESU, counted as an agricultural kind TF41 i TF431.

3. Research results

3.1. Determinants of the potential and production

Total number of farms running continuous accountancy in the frame of Polish FADN, oriented at breeding dairy cattle amounted to 1640 (Table 1).

[1] Metodyka liczenia nadwyżki bezpośredniej i zasady typologii gospodarstw rolniczych FAPA, Warszawa 2000, p. 10-20

Table 1

The area and the economic size of farms concentrating on breeding milk cows

Detailed contents	Year	Farms in general	Farms according to the number of cows				
			up to 10	10-20	20-40	40-60	60 and above
Number of farms in a sample	2004-2006	1640	380	722	445	68	25
Area of arable land (ha)	2004	17.33	10.65	21.00	34.02	62.17	147.17
	2005	17.58	11.27	21.71	35.64	63.89	138.89
	2006	17.37	11.18	21.73	36.08	67.75	152.70
Rented land share in %	2004	21.7	13.1	23.4	27.3	32.8	52.4
	2005	21.7	13.6	25.1	27.2	34.4	38.0
	2006	22.0	13.4	24.8	28.8	37.4	53.1
Economic size in ESU	2004	10.1	5.4	12.5	22.5	42.6	‘91.3
	2005	9.9	5.3	12.6	23.5	44.7	90.0
	2006	9.6	5.2	12.6	23.6	46.6	105.0

Source: authors’ research based on FADN data in Poland between 2004 and 2006, Institute of Agricultural and Food Economics in Warsaw

Table 2

Value of the selected elements on farms oriented at keeping dairy cattle

Detailed contents	Year	Farms in general	Farms according to the number of cows				
			up to 10	10-20	20-40	40-60	60 and above
Total value of assets in PLN (condition at the end of a year)	2004	297,762	184066	352441	610818	1 134261	2131919
	2005	301,653	185,163	365,146	670,426	1,297,035	2,476,388
	2006	313903	191,600	391,247	714520	1,412,100	2,689,787
Total value of assets in proportion to 1 ha of arable land (PLN /ha)	2004	17184	17277	16785	17954	18245	14486
	2005	17,161	16428	16820	18812	20301	17830
	2006	18069	17142	18006	19803	20843	17615
Total value of assets per a full - time working person (PLN / AWU)	2004	170,630	116191	189458	294,681	431459	417812
	2005	174,936	119469	194994	318931	473,154	405,493
	2006	184267	125,554	209,204	339,993	516,134	437,757
Value of machines and equipment per 1 ha of arable land (PLN /ha)	2004	4134	3661	4049	4962	5431	3470
	2005	3880	3080	3945	5019	5829	3980
	2006	3923	3082	4022	5194	5640	4127
Value of machines and equipment per a full - time working person (PLN/ AWU)[2]	2004	41045	24623	45697	81442	128438	100,085
	2005	39552	22401	45734	85098	135,860	90523
	2006	40005	22575	46730	89175	139,662	102,553
Share rate of fixed assets in %	2004	88.1	88.6	88.2	87.7	88.6	83.9
	2005	88.4	88.0	88.5	88.9	89.5	84.3
	2006	87.3	87.3	87.3	87.9	87.7	83.1
Index of buildings share in total assets (%)	2004	39.5	45.2	40.1	35.5	35.4	31.1
	2005	39.0	44.4	38.1	33.6	32.5	28.8
	2006	38.3	43.8	37.2	32.8	31.1	26.3

Source: see Table 1

[2] AWU – Annual Work Unit

These farms with respect to the year represented in Poland from 62.8 to 65 thousand of farms over 2 ESU with the analogical orientation in production. The biggest group of farms in the system consists of farms that keep between 10 and 20 cows.

The average area of a dairy farm presented in FADN was slightly above 17 ha of arable land and was similar to the average area of farm included in FADN system. Area quantity of the analysed group heavily correlates with the quantity of kept cows. On the farms where the number of breeding cows was not big, changes in the area quantity were substantially small. Farms that keep at least 20 or above cows were characterised by a bigger increase in arable land. It is worth to notice that on the farms with the biggest number of cows (above 60 heads), the area of arable land in 2005 has significantly decreased. The main reason for that was a decrease in the area of leased land from 53% in 2004 to 38% in the following year. There was a substantial increase of arable land in the same group in 2006. Smaller farms are above the average when it comes to the share of own land in farming. On farms keeping less than 10 cows leased land constitutes 13% (a national average for dairy farms constitutes 22%) and on farms with the number of cows above 60 it constitutes over 50% (except for the year 2005). One may then conclude that lease system is among the conditions for increasing the scale of milk production on Polish dairy farms. An economic size of farms measured in ESU units remains in relation to the number of kept cows and consequently to the size of farm area. However, it is worth to notice that on farms with the biggest scale of production, despite a substantial decrease in the size of arable land in 2005, the economic size of farms was reduced only slightly. This indicates that there is a stronger relationship between the economic size of farms and the scale of milk production than with the size of farm area.

Data describing the production potential of dairy farms in terms of selected values of assets are presented in Table 2. Total value of assets strongly depends on the scale of production. Still, the level of investments measured in the value of assets per 1 ha of arable land, in particular groups of farms differ only slightly. The level of investments little exceeding the average level is seen on farms keeping from 20 to 60 cows. On the contrary the level of technical fittings of labour measured in the value of assets per a full-time working person increases together with the scale of production. Farms with the biggest scale of production require over 3 times bigger value of assets per each employee than farms keeping up to 10 cows. It is clear from the table that increasing the scale of production is a capital - intensive process (Sass R., 2004, Sass R., 2007).

The level of investments measured in the value of machines, equipment and transport means per 1 ha increases together with the growth of the scale of production. Nevertheless, it diminishes greatly while the herd consists of over 60 cows. There is a similar tendency in the level of technical fittings of labour measured in the value of machines and equipment per a full-time working person, but an increase of this quantity is substantially higher. On farms keeping 40-60 cows this rate is over 5-times higher than on farms where the number of cows does not exceed 10 heads. Small differences in the level of employment between those groups of farms are paid with the considerable growth of the expenses for machines and equipment replacing the labour force that had to be met. Therefore a possible rise of the scale of milk production on farms requires fundamental changes in used technologies of production. Farms oriented at breeding dairy cows belong to the same group of farms, in which a share of fixed assets in the structure of all assets is among the highest (Mańko S., 2008). It involves the necessity of building expensive livestock buildings as well as equipping it with numerous machines and devices. The average share of fixed assets in the structure of all assets at dairy farms comes up to around 88% and virtually does not depend on the size of a kept herd of cows (Table 2). Only farms breeding 60 and above cows show lower than the average share of fixed assets, that is around 5%.

The main components of the fixed assets at dairy farms are buildings. They constitute about 40% of the total value of assets. Depending on the year, on farms keeping up to 10 cows, this rate oscillates around 44-45%, while on farms breeding over 60 cows; it only fluctuates around 26- 30% (Table 2). In all groups the index becomes smaller as the time passes; it is mainly related to the general increase in assets, together with the quite stable value of buildings.

FADN Standard Results do not allow fully analysing the organisation of production among the ranked farms. Above all they do not contain data concerning the structure of arable land, thus greatly hindering the analysis of the structure of crops. It is only possible to relate selected groups of plants to the area of arable land.

Table 3 presents the selected elements of animal and crop output. Grains constitute an average of 37% of arable land in the dairy farms and their share in the structure of crops slightly exceeds 50%. It allows farmers to use a crop rotation system. Crops participation significantly drops in relation to the increase of production from around 40 to 27%. Higher scale of milk production needs stronger submission of plant production to the animal production. The share of plant area used for feed grains proves it. The share

Table 3

Production organisation at farms that concentrate on breeding dairy cattle

Detailed contents	Year	Farms in general	Farms according to the number of cows				
			up to 10	10-20	20-40	40-60	60 and above
Crop share in arable land (%)	2004	36.9	39.5	38.1	32.6	27.7	27.4
	2005	36.9	39.5	37.6	32.8	24.9	26.7
	2006	36.7	40.6	36.3	31.9	23.7	27.5
Share of fodder crops in the structure of arable land (%)	2004	58.0	54.4	57.1	63.0	68.5	69.9
	2005	47.5	44.9	44.9	55.0	62.0	60.2
	2006	58.6	53.5	59.4	64.3	72.8	69.7
Cow milk productivity in kg per a cow	2004	4484	3821	4418	5,100	5637	6217
	2005	4735	4004	4712	5446	6254	6326
	2006	4816	4,141	4801	5458	6428	6531
An average number of cows in a year (in heads of cattle)	2004	11.4	6.1	14.1	25.8	46.2	94.6
	2005	11.5	6.1	14.9	27.2	49.3	99.6
	2006	11.2	6.0	14.9	27.7	50.5	110.5
Number of cows fed through the grazing system (LU) [3] per 1 ha	2004	1.58	1.46	1.63	1.68	1.61	1.39
	2005	1.55	1.38	1.62	1.69	1.59	1.51
	2006	1.53	1.38	1.59	1.68	1.56	1.61

Source: see Table 1

Table 4

Selected indexes of the financial balance analysis on farms oriented at keeping dairy cattle

Detailed contents	Year	Farms in general	Farms according to the number of cows				
			up to 10	10-20	20-40	40-60	60 and above
Debt index (%)	2004	8.7	3.2	8.5	14.0	19.9	32.7
	2005	8.2	2.6	8.2	14.5	18.1	30.0
	2006	8.6	3.1	9.3	14.2	17.4	27.8
Short-term debt index (%)	2004	27.2	39.9	28.9	22.1	26.6	20.7
	2005	24.0	34.8	26.0	19.3	25.7	18.3
	2006	25.4	31.4	25.7	23.8	21.6	21.7
Net investments (PLN)	2004	3093	-2340	4339	19384	50930	83932
	2005	7947	-1162	11,600	43499	105704	85296
	2006	8441	-569	15514	35695	86054	69766
Index of retrieved fixed assets (%)	2004	5.6	3.1	5.7	7.8	9.1	14.5
	2005	7.3	3.9	7.8	11.3	13.0	7.4
	2006	7.3	4.2	8.6	9.7	10.9	7.3

Source: see Table 1

of feed grains in the structure of arable land rises from 54% to almost 70% (Table 3).

The level of cows' milk capacity greatly correlates with the scale of production (Table 3). Cows' milk capacity was rising in a sample period in all groups of farms. An average annual cows` milk capacity on farms keeping up to 10 cows is lower by around 60% in comparison with farms keeping 60 and above

[3] LU - Livestock Unit

heads. The number of conversion animals per 1 describes the usage of fodder area, and indirectly also its productivity, ha of the main fodder area. There were approximately a little more than 1.5 LU of the animals breed with the bulky feed per one hectare of the fodder area, and in the analysed period this rate was decreasing.

3.2. Value of output and costs

Net value of investments realised on farms is related to the scale of production. To illustrate this it is worth to notice that on farms where up to 10 cows are kept net investments in the sample period had a negative value (Table 4). Depending on the year, the index of retrieved fixed assets on farms keeping up to 10 cows amounted from 3.1 to 4.2%, and on farms breeding over 60 cows from 7.3 to 14.5%. Indebtedness of dairy farms is also related to the scale of milk production, and on the farms with the smallest production the rate of debts amounts to 2.6 to 3.2% while among the farms that keep over 60 cows the debt rate oscillates between 27.8% and 32.7%. The structure of indebtedness also shows relation to the scale of cattle output. On farms keeping up to 10 cows short term indebtedness constitutes 31-40%, and on farms with 60 cows and above from 18 to 22% (Table 4).

Total value of output in sample years in all groups of farms shows a significant increase (Table 5). Farms with the biggest scale of production have over 23 times higher output than farms with the smallest scale of production. On the contrary there was a 17 times bigger difference in the headage of dairy cattle between farms with the highest and smallest scale of production. As a result we may say that the production increases faster than the scale of production measured in the number of cows. Undoubtedly, the increase in the cows' milk capacity affects this situation (Table 3). Thus the effect of a scale is visible (Sass R., 2004 Sass R., 2007).

Land productivity rises together with the quantity of animal output, thus being a consequence of growing stock and bigger milk capacity of cows. The scale of production also affects the economic work output measured with the value of production per a full-time working person and a productivity index of assets.

The share of milk and dairy products amounts to 53-56% on farms keeping up to 10 cows and rises up to 73-82% on farms with the biggest headage of cows. Together with an increase in the scale of production, the level of specialisation of farms oriented at milk production also rises (Table 5).

The amount and diversity of total costs correspond to the amount and diversity of the output. Intensity of production, measured by the total cost per 1 ha of arable land, similarly to the land productivity, increases together with the scale of cattle output. The level of costs per 1 ha on farms with the biggest number of cows in 2006 was almost twice as high as on farms keeping up to 10 cows (Table 6). This relation was smaller in the previous years. In the view of the above data we may say that on farms with the big scale of milk output not only the level of production intensity is higher, but also the pace of intensification is faster.

Index of the relative level of costs (also called the cost of creating an output worth PLN 100 in dairy farms amounts to 70%. This type of cost is

Table 5

Production results on farms concentrated on dairy cows breeding

Detailed contents	Year	Total farms	Farms according to the number of cows				
			up to 10	10-20	20-40	40-60	60 and above
Total value of output (PLN)	2004	71360	34514	87518	175713	328364	801,302
	2005	74,112	36652	94364	192040	396521	818215
	2006	76770	39422	98961	199981	421,100	969,670
The productivity of land (d/ha)	2004	4,118	3240	4168	5,165	5282	5445
	2005	4216	3252	4347	5388	6206	5891
	2006	4419	3527	4554	5543	6216	6350
Economic work output (PLN /AWU)	2004	40893	21787	47046	84770	124,906	157039
	2005	42979	23648	50392	91356	144649	133,978
	2006	45065	25833	52916	95,158	153916	157812
Share of milk and dairy products in total output (%)	2004	63.1	53.7	62.7	70.2	76.1	72.9
	2005	66.9	55.6	67.9	74.9	79.4	81.6
	2006	63.3	56.8	64.8	72.9	78.2	77.8

Source: see Table 1

Table 6

Total costs and direct costs on farms oriented at keeping dairy cattle

Detailed contents	Year	Farms in general	Farms according to the number of cows				
			up to 10	10-20	20-40	40-60	60 and above
Total costs per one farm (PLN)	2004	50206	27220	59743	112512	220818	646,030
	2005	50861	28101	63029	120,862	237,860	623,692
	2006	53284	30116	66231	129,092	267,563	767,049
Total costs in PLN per 1 ha of arable land	2004	2897	2555	2845	3307	3552	4390
	2005	2893	2493	2903	3391	3723	4490
	2006	3067	2694	3048	3578	3949	5023
Direct costs in PLN per 1 ha of arable land	2004	1457	1,164	1449	1770	1971	2487
	2005	1376	1072	1400	1751	1955	2291
	2006	1484	1,192	1503	1,859	2,102	2605
Total cost of PLN 100 of output	2004	70.4	78.9	68.3	64.0	67.2	80.6
	2005	68.6	76.7	66.8	62.9	60.0	76.2
	2006	69.4	76.4	66.9	64.6	63.5	79.1
Cost of feed for ruminant animals in PLN per 1 LU	2004	857	764	834	926	1066	1376
	2005	804	731	783	878	975	1260
	2006	843	787	811	915	1005	1360

Source: see Table 1

the highest on farms where the scale of production is the biggest but also on farms with the smallest production scale. The most advantageous relation is observed on farms keeping between 20 and 60 cows. On farms where over 60 cows are kept the cost of creating an output worth PLN 100 grows by over 20% in relation to farms that keep from 10 to 60 cows (Table 6).

Value of the farm production greatly depends on the amount of direct costs. The level of direct costs in relation to 1 ha of arable land increases together with the scale of production, but differences between farms with the smallest and the biggest scale of production are considerable in comparison with the former quantities. The basic element of the direct costs at animal farms is feed. The participation of feed in dairy farms constitutes 25-28% of the general costs. What is more, this participation strongly correlates with the scale of animal production. The value of feed per a conversion unit of animal (LU) almost doubles with the scale of production (Table 6). It is mainly related to the level of cows' milk capacity but also indicates the technological differences in the animal production.

1.3. Financial outcomes

The size and diversity of the financial results measured in the family farm income and the rough calculation of profits is shown in Table 7. The income from a family farm per one farm was rising across the years and was positively correlated with the scale of production. Taking into account all studied farms, in 2005 the income grew by 32.6% in comparison with the previous year, and in the next year by 16.8%. In 2005 the biggest increase was observed on farms with the smallest scale of production (68.7%), while the smallest increase on those keeping between 20 - 40 cows. In the following year the smallest farms experienced a growth by 30.7% and the biggest by 9%. On farms with the smallest number of cows the income was doubled during the whole studied period. However, it should be emphasised that the observed growth started at a very low level. Income per a full-time working member of a family on farms keeping up to 10 cows amounted to almost PLN 5.3 thousand in 2004 and to PLN 12.1 thousand in 2007. It is hard to describe this amount as a satisfactory one for a farmer and his/her family. The higher was the scale of production, the higher salary is observed. On farms keeping between 40 and 60 cows the number of hired workers is rather small; therefore those farms are still counted as family ones. On those farms the income in relation to a full-time working member of a family amounted to PLN 56.5 thousand in 2004 and to PLN 91.8 thousand in 2007 (Table 7). Income that allows exceeding the parity level of farmer's own work in 2004 was reached and crossed by the farms breeding 20 and more cows, and in the following years also by the 10 to 20 cows group.

Table 7

Financial outcomes on farms oriented at keeping dairy cows

Detailed contents	Year	Farms in general	Farms according to the number of cows				
			up to 10	10-20	20-40	40-60	60 and above
Farm income (PLN)	2004	23073	8326	30035	67172	120981	179495
	2005	30598	14046	40021	82921	179632	257181
	2006	35761	18356	46850	93923	201,673	280,230
Income per a full-time working person (PLN / FWU)[5]	2004	13514	5281	16398	34223	56521	91,185
	2005	18,181	9125	21724	42072	83554	127,092
	2006	21,547	12,158	25587	47332	91,801	147,136
Share of the balance of subsidies and taxes in a farm income (%)	2004	11.4	16.2	10.2	9.1	13.5	19.6
	2005	29.0	40.8	26.8	22.2	19.1	29.0
	2006	40.7	55.2	37.5	30.3	27.5	32.5
Rough profit from a farm (PLN)	2004	-8,252.2	-20,601.2	-3,571.1	31,158.7	81,707.4	143,377.1
	2005	-1,836.2	-15,619.1	4,517.0	44,936.7	138,199.2	218,182.7
	2006	1 833.2	-11,599.1	10,522.6	54,553.6	158,087.2	242,443.0
Profitability of farm's own capital (%)	2004	-3.0	-11.6	-1.1	5.9	9.0	10.0
	2005	-0.7	-8.7	1.3	7.8	13.0	12.6
	2006	1.0	-6.2	3.0	8.9	13.6	12.5

Source: see Table 1

The size of income of a family farm depends largely on the level of operational and investment subsidies. It is proved by the balance of subsidies and taxes in the sum of income. Size of the formally allocated subsidies[4] which in 2004 was reduced by the paid taxes, amounted to an average 11.4% and in 2006 to 40.7% of the total farm income. The biggest share of the subsidies and taxes balance in the income was observed on farms with the biggest and the smallest scale of production. In 2006 on farms with the smallest scale of production the balance exceeded 55% of the total amount of income. A significant improvement in the economic situation in this group of farms was therefore achieved due to operational and investment subsidies. In 2004 the smallest share of this balance was observed among farms keeping 20 to 40 cows (9.1%) while in the years 2005 and 2006 at farms with 40 - 60 cows (19.1 and 27.5% respectively).

Family farm income should guarantee a salary for a farmer and his family, payment for the used farm's own capital as well as other costs connected with the risk of running a farm. For the purpose of an analysis agricultural economists often use a category of economic costs in which, apart from the farm's real costs, alternative costs are included. This type of costs includes an estimated cost of farmer's own work and an interest of farm's capital, in this rough value of rent for farmer's own lands. If the income from the family farm exceeds alternative costs, the surplus is treated as a payment for managing the farm and all risk connected with that. An estimated profit from a farm is calculated in Table 7. It takes into account the parity level of payment for farmer's own work corresponding to the annual net income in the national sector. In 2004 this value amounted to PLN 18 348 in 2005 to PLN 19 272 in 2007, PLN 19 840 per a full-time employee. Profit calculated in this way ought to ensure a return of own capital and a surplus connected with managing a farm and a risk of running it. Farms with the smallest scale of production during the whole sample period as well as farms keeping between 10 and 20 cows in 2004, suffered from a financial loss. An average income for the whole examined group of farms has shown a negative value in 2004 and 2005. It is reflected in the profitability of production, assets and farm's own capital. The rate of profitability of own capital on farms keeping 20 and above cows exceeds the interest rate of long-term deposit bank accounts, which means that on these farms the effect of a financial mainspring is observed.

[4] Subsidies to which farmers are entitled, but were not formally allocated till the end of a given year, in FADN register are entered for a year to come.

[5] FWU – Family Work Unit

4. Conclusions

- The analysis of farms oriented at milk production was used to assess the influence of the scale of production measured in the number of cows on the farms` financial situation. The assessment of the connections of the production potential and the scale of production shows that as far as dairy farms are concerned these connections are very strong, not only while taking into account the arable size of a farm but also with the employment and the value of the property engaged on a farm. Although proportions of the particular elements of the production potential are changing together with the scale of production, they are mainly related to the level of employment and equipment in machines and devices that substitute labour force. Other elements of the potential are changing more or less in the proportion to the size of the herd of milking cows.
- The structure of assets and liabilities remains in connection with the scale of animal output. Together with the increase in the scale of production the level of fixed assets becomes slightly smaller while the level of indebtedness, especially long - term one, rises. The investment possibilities of the farm also change. Farms with the smallest scale of production have reduced possibilities of investments and as a result of this, farms net investments have negative value. In the studied time period these farms could not reconstruct depreciated fixed assets.
- The dairy efficiency of cows shows a strong connection with the scale of production. This indicates indirectly a relationship between the scale of production and the technological level of farms. There are also striking differences in the level of cows` milk capacity. Farms with the biggest scale of production obtain about 60% more milk from a cow per a year than farms keeping up to 10 cows.
- Productivity of the basic means of production (land, work and capital) depends heavily on the scale of production. It is especially observed in case of economic work output, which on farms with the biggest scale of production is about 5-6 times bigger than on farms with the smallest scale. Productivity of land strongly correlates with the intensity of production measured with the total level of costs per 1 ha of arable land and the change in the structure of costs. The higher the scale is the higher the level of production intensity is presented.
- Family farm income, especially per a full - time working family member, remains heavily dependent on the scale of production. It is necessary to keep at least between ten and twenty cows on the farm to sustain the level of income that ensures cost - effectiveness. Taking into account the influence of the subsidies and taxes balance on the level of income, it seems reasonable to assume that the minimal number of cows, with which a farmer may obtain the income per one person comparable with the net salary outside the farming, in the analysed period diminishes. However, it is hard to assume that the situation will last in the longer perspective. One should also take into account the opposite tendency, namely, while keeping the income on the level of parity depends on the scale of production.
- To sum up, upon the analysis of the data it became apparent that keeping less than 20 cows does not ensure an appropriate level of income. The analysis of the costs of production also indicates that the most profitable level of costs in observed on farms keeping from 20 to 60 cows.

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Issues of Food Consumption in Latvia

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Abstract
The studies in the field of food consumption are prevalent object of the research, and have an increasing importance or significance for elaboration the international and national policies and related economic instruments in relevance with the society well-being. The paper presents main results of the studies devoted to the estimation of food, *inter alia* different food products' groups, consumption trends and patterns in Latvian households, where the different income levels (quintiles) have been taken into consideration. The trends of the share of expenditures for food and expenditures for food groups and different products have been estimated and compared. The patterns and trends of consumption (quantitative) of food groups and several products have been evaluated and compared between different income levels (quintiles) of the households. Special attention has been paid to the main product groups such as bread and cereals, meat and meat products, and vegetables and fruits. The results show that the main trends of the food consumption are in line with the global and European trends.
Key words: food consumption, household, income, quintile, Latvia.

Introduction
The importance of consumption in modern societies is constantly growing and consumption processes are constantly gaining (Hansen, Schrader, 1997). On the European Union (EU) level (Council of Europe, 2006) an agreement has established that the consumption is responsible when it takes into account its impact on the quality of human life in the every dimension: health, natural resource management, economy, spatial planning, environment, fight against poverty and social exclusion, social life, culture, etc.

The studies in the field of food consumption are very important for the elaboration of an international and national policies, and implementation of policy-related economic instruments, which are oriented for assurance of food security; satisfaction of public demand for health and well being *inter alia* healthy diet, and elimination of the food poverty. Food security has been defined by B. Senauer and T. Roe (Senauer, Roe, 1997) using the World Bank's definition "access by all people at all times to enough food for an active healthy life" and pointed out that the food security is, therefore, ultimately a household and individual-level issue. The growing awareness of food poverty as a structural constraint on food consumption and dietary intake among low-income groups, and its multi-faceted consequences for health, education and social participation (Goodman, Anise, 2006), as outlined in the national policies of many countries *inter alia* developed, for instance, Ireland (Combat Poverty Agency, Crosscare & Society of St Vincent de Paul, 2004).

Moreover, in the past decade food consumption had been studied within the context of human health issues. For instance, French researcher E. Riboli (Riboli, 2001) who reviewed different studies, made conclusion that incidence of (and mortality from) cancer of the breast, colorectal and prostate were positively correlated with the foods most typically consumed by the Western societies (i.e., meat, total and animal fat, simple sugars) and negatively correlated with the consumption of various vegetable foods (grains, cereals and vegetable fiber). Food strategies must not merely be directed at ensuring food security for all, but must also achieve the consumption of adequate quantities of safe and good quality foods that together make up a healthy diet.

Two broad approaches: one - dealing with a household's food consumption based on the budget surveys (Regmi, 2001; Senauer, Roe, 1997 etc.) and the other - analysing the effects of socio-economic differences on food consumption by special surveys (Popkin et al., 1996; Darmon et al,., 2003) can be used in investigation of food consumption patterns. For assessing food consumption patterns in Latvia only one of these approaches can be used, namely, household food expenditures, as there is lack of adequate surveys for analysing socio-economic factors, due to financial restrictions, which could provide more detail quantitative and qualitative data.

The **aim** of the study is to estimate the trends and patterns of food consumption in Latvia.

The **object** of the research is food consumption patterns and their trends; *inter alia* consumption of

different groups of food products, including different income groups.

The study includes the following **tasks**: to estimate 1) the structure and trends of inhabitant's food expenditures and; 2) food consumption patterns and trends of the past years and their dependence on different income level of households.

The principal **materials** used for the studies are as follows: different sources of literature, research papers and reports of institutions, published and unpublished data from the Central Statistical Bureau of Latvia (CSB) as well as the database (1997 – 2008) of Household Budget Survey (HBS) done by the CSB.

Both qualitative and quantitative research **methods** were used in this study: analysis, data grouping, reference, logical and abstract constructive methods etc. The analysis methods include: ratio analysis, historical trend analysis, and linear regression analysis using software tools.

Due to the limited space only the most important results of the research are set out in the paper.

1. Results and discussion

1.1. Expenditures for food

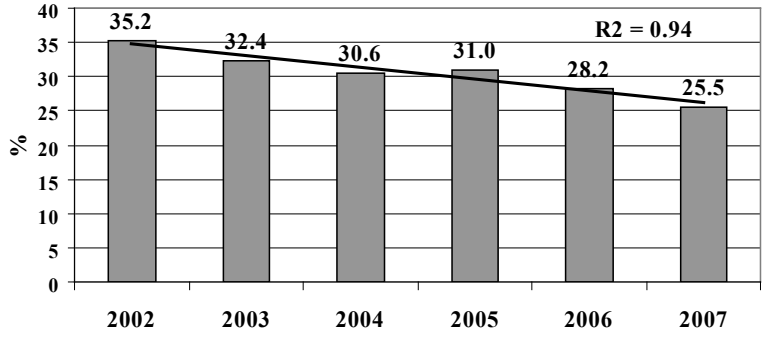
The market economies do not exist for their own sake; they are ethically legitimised by the fact that they ensure the most comprehensive satisfaction of human needs. According to Adam Smith, who was cited by H. Van Schalkwyk (Van Schalkwyk, 2003) - "Consumption is the sole end and purpose of all production". In the study performed by M. Gehlhar and W. Coyle (Gehlhar, Coyle, 2001) the different economic factors have been identified and explained; the shifts in consumption patterns, where economic factors contain income growth and food expenditures, factors of production, transport costs, and trade policy changes. Of these determinants, income growth and its impact on food consumption was determined as most important, and explained the changes in food consumption patterns. At the same time these authors indicate that consumption patterns are a function of many factors and not always directly related to income changes. The food consumption can relate to the lifestyle changes and can lead towards greater food purchases away from home, reducing preparation costs. As this occurs some food commodities may experience not only a decrease in the share of food expenditure, but also an absolute decline in consumption per capita.

Although in Latvia the percentage share of expenditures per capita for food of Latvian households decrease (Figure 1); the share still remains high comparing with other countries, and according to American author's A. Regmi et al. (Regmi et al., 2001) rating, Latvia is in the group of middle income countries on the whole world level. At the same time, comparing the income elasticity for food, beverages, and tobacco consumption for all the EU countries, Latvia is the last with income elasticity - 0.62, where Luxemburg – 0.13 and Denmark 0.25 show best results. American authors consider that, in general, lower income countries spend a greater proportion of their budget on necessities such as food, while richer countries spend a greater proportion on luxuries.

Similar results have been observed comparing the share of expenditure for food and expenditures in lats (LVL) between different quintiles of Latvian households (Figure 2 and Figure 3), where in 2007 the share for Quintile 1 (35%) is 1.9 times higher than for Quintile 5 (18%).

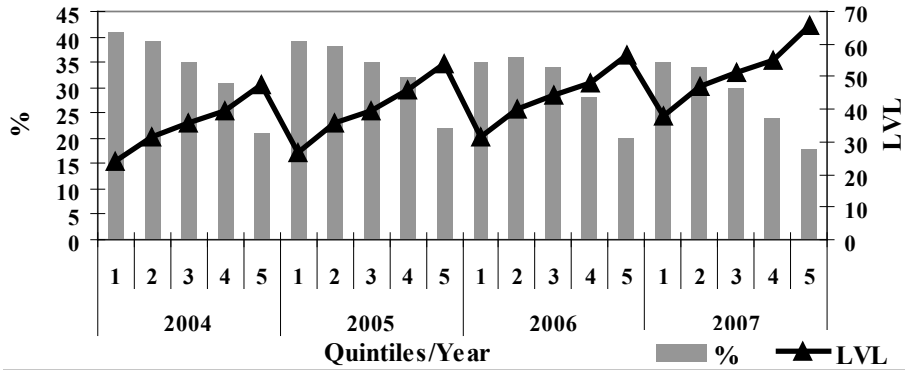
Comparing expenditure for different food products in 2007, in evidence that expenditures in lats (LVL) for all staple food product groups by income level or quintiles have increased excluding potatoes as shown in Figure 4.

In most households, the majority of food consumed by household members is purchased—either from supermarkets or grocery stores to be eaten at home, or from cafeterias, restaurants, or vending machines to



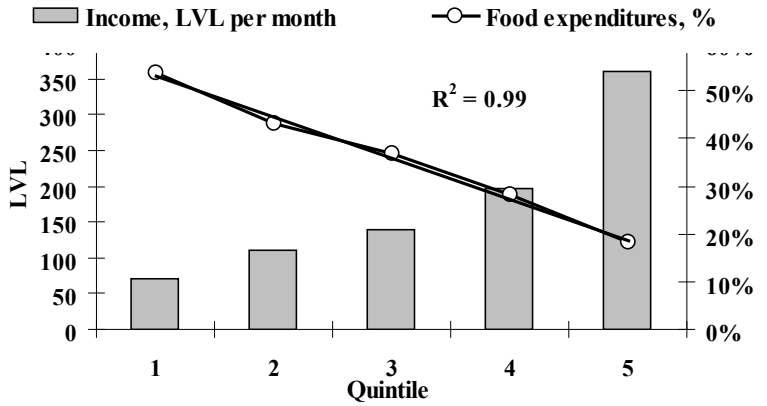
Source: author's calculations based on the data from the Central Statistical Bureau

Figure 1. **The share of expenditures per capita for food in Latvia between 2002 and 2007, %**



Source: author's calculations based on the data from the Central Statistical Bureau

Figure 2. **The share of expenditures per capita and expenditures (LVL) for food by quintiles in Latvian households between 2004 and 2007, %**



Source: author's calculations based on the data from the Central Statistical Bureau

Figure 3. **The relationship between income (LVL) and share of expenditure (%) for food by quintiles in Latvian households in 2007**

be eaten outside the home. The amount of money that a household spends on food, therefore, provides the insight into how adequately it meets the food needs.

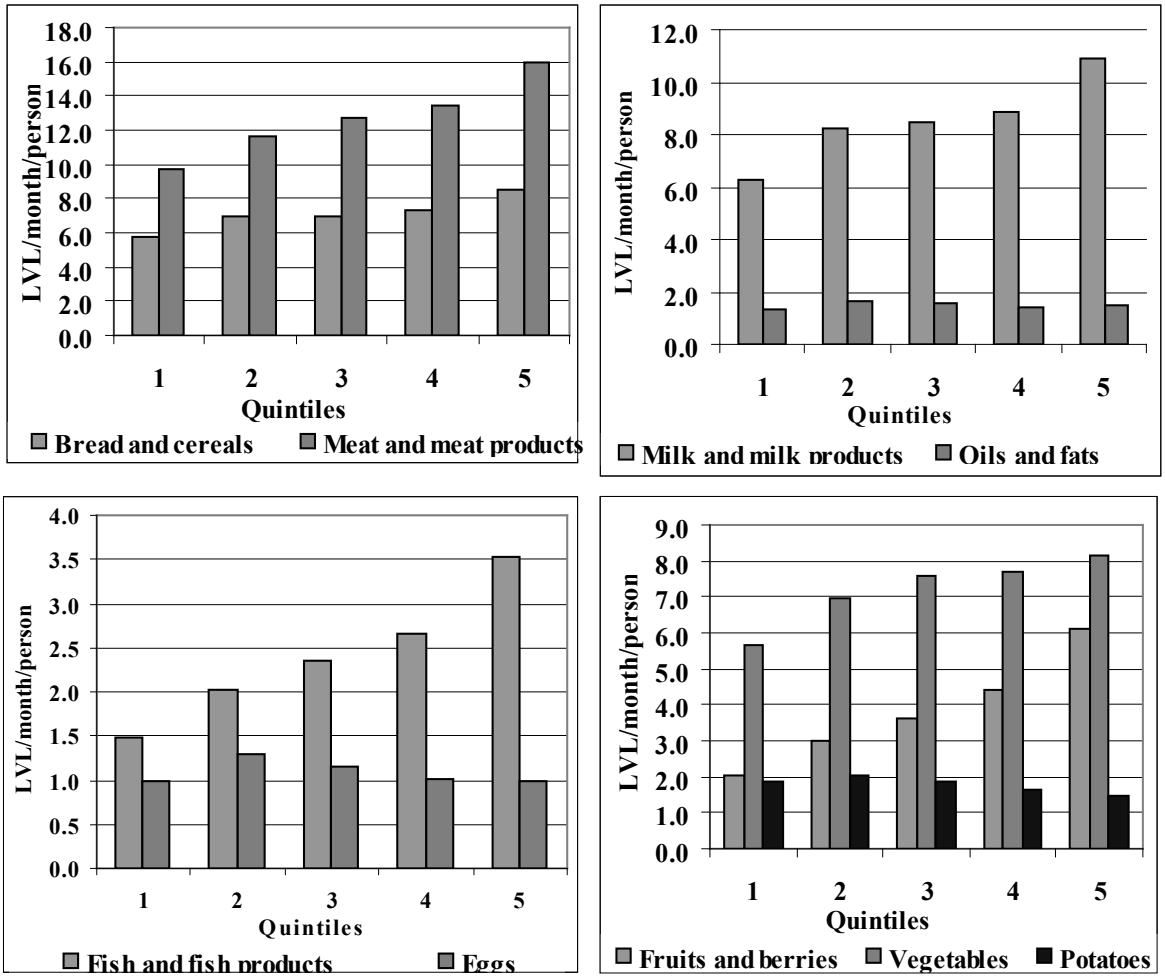
In Latvia the share of expenditures for food, which has been consumed out of home (in public catering sector – cafeterias, restaurants, and similar places) has increased year by year both in all the households (average), and in different quintile's group as has been shown in Figure 5.

With increasing number of urban population in Latvia the author forecasts that more convenience and processed foods will appear in nutrition of the population, as urban occupations raise the opportunity costs of time needed to prepare meals.

1.2. Food consumption trends

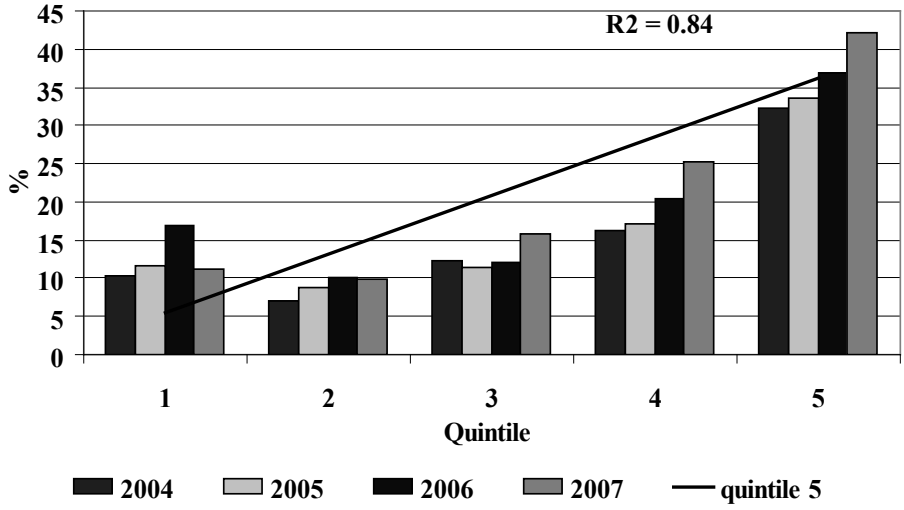
In Latvia food consumption policy has been worked out by the Ministry of Health (Veselības ministrija, 2003), who has elaborated Basic Approaches to "Healthy Nutrition for 2003 – 2013", where the nutritional habits of Latvia are analysed and the biggest problems identified as well as goals to be achieved in this time frame are listed for stimulating healthy food consumption in the society. For implementation of the basic approaches "A Plan for Implementing the Basic Approaches to 'Healthy Nutrition for 2003 – 2013'" has been developed (Veselības ministrija, 2004). The main task of this plan is to implement the complex of measures for ensuring inhabitants with healthy, safe, and available nutrition, for promoting a healthier life style, for improving the health condition of inhabitants, to lessen the rate of sickness and mortality due to sicknesses that are connected with inferior nourishment or undernourishment, unhealthy food habits as well as insufficient physical work load. The significance of decreasing of fat consumption, increasing vegetable, fruits, berries, and legumes has been emphasised in the plan.

The results of author's research show that the role of bread and cereal products in the consumption



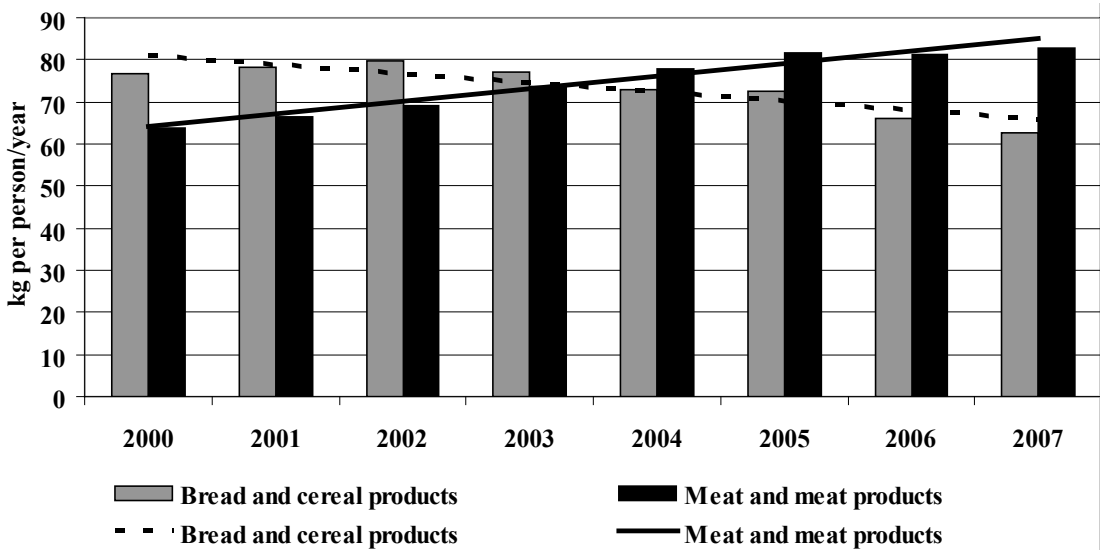
Source: author's calculations based on the data from the Central Statistical Bureau

Figure 4. **Expenditure per capita (LVL/month) for different food groups by quintiles of Latvian households in 2007**



Source: author's calculations based on the data from the Central Statistical Bureau

Figure 5. **The share for catering of food expenditures by quintiles of Latvian households between 2004 and 2007, %**



Source: author's calculations based on the data from the Central Statistical Bureau

Figure 6. **The trends of bread and cereal, and meat and meat products consumption (kg/person/year) in Latvian households between 2000 and 2007**

Table 1

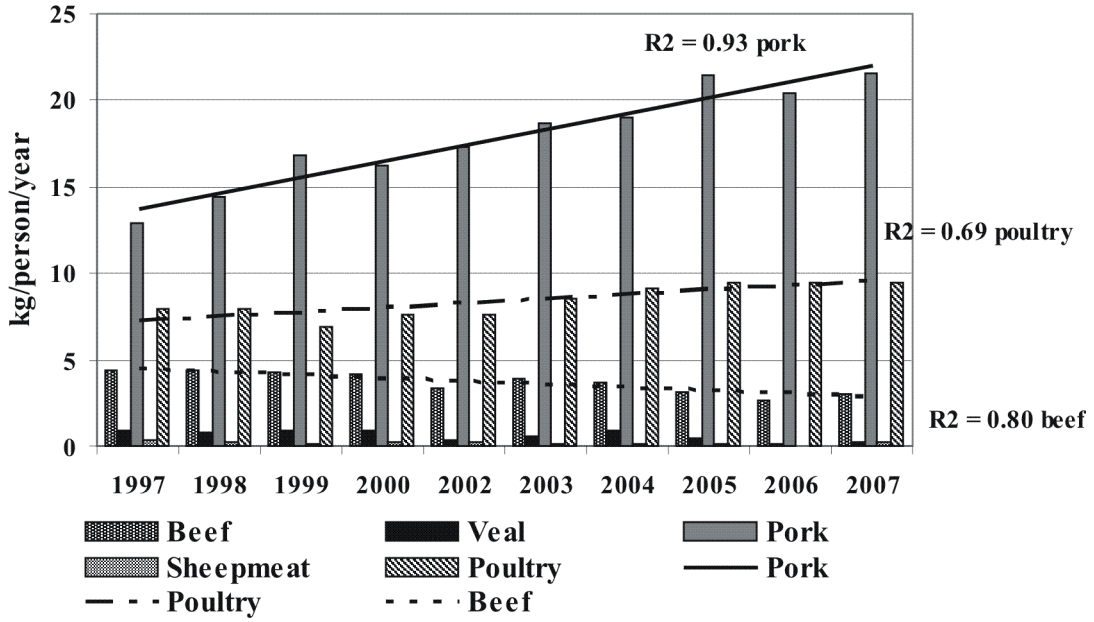
The proportion between quintiles (1/5 and 5/1) of quantitative per capita food products consumption in Latvia, 2007

Group of products	Proportion between quintiles	
	1/5	5/1
Bread and cereal products	1.3	0.7
Meat and meat products	0.8	1.2
Milk and milk products	0.8	1.3
Fish, sea food and fish products	0.8	1.3
Eggs	1.1	0.9
Fruits and berries	0.4	2.3
Vegetables	0.9	1.2
Potatoes	1.4	0.7
Sugar, honey, chocolate and other sweets	1.4	0.7

Source: author's calculations based on the data from the Central Statistical Bu*reau*

of Latvian population decreases, where in 2003 the consumption was 77.2 kg per capita, but in 2007 it was 62.6 kg. This trend conforms to results of other researches, which recognize that bread consumption is contrary to the population income level (The Federation of Bakers, 2005).

The consumption of bread and cereal products is conversely related or correlated to inhabitant's income level as well as with the consumption of meat and meat products that can be characterised as stably increasing (Figure 6). For instance, if in the year 2003 total meat and meat products consumption was 73.8 kg per inhabitant per year then in 2007 it has increased to 82.8 kg per capita. American researchers (Regmi et al., 2001) argue that in low per capita income countries, cereal consumption accounts for a large share of the total food budget and as per capita income rises, consumers in these countries will shift some consumption away from lower value cereals to higher value livestock products. In developed countries, where income and livestock product consumption are already high, consumers are expected to make relatively small adjustments between food consumption groups with changes in income levels. In Latvia we can observe that the trends in consumption of bread and cereals and meat



Source: author's calculations based on the data from the Central Statistical Bureau

Figure 7. **Per capita consumption (kg/year) of different kind of meat in Latvia between 1997 and 2007**

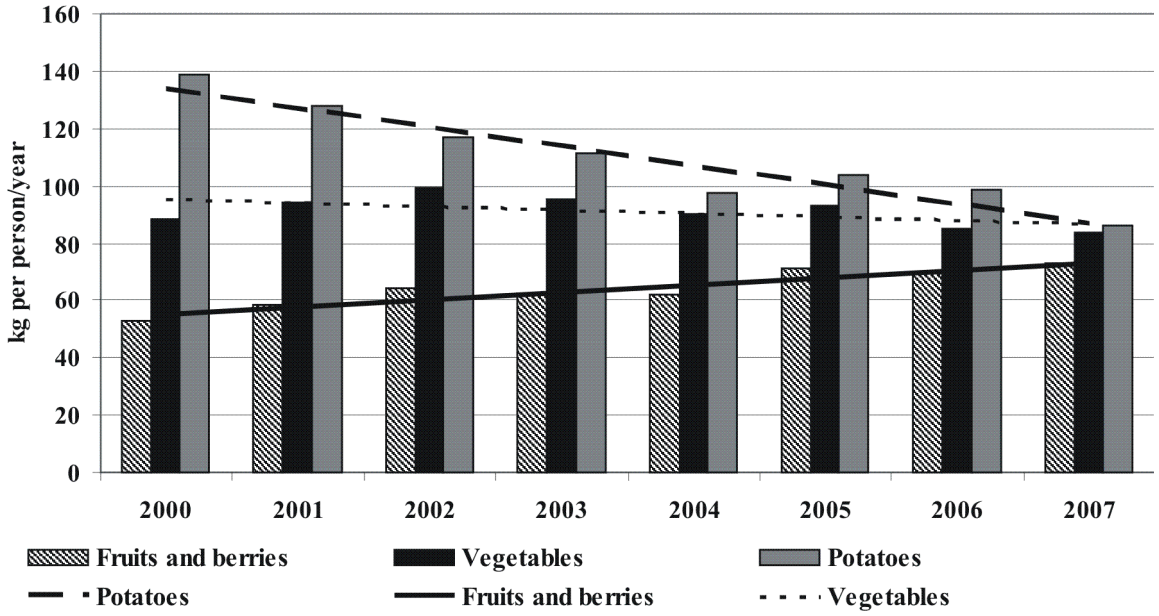
and meat products (Figure 4) accord with reported inference of the authors mentioned above. This argument is suitable, if we compare and analyse the consumption of these groups of products in different income levels' groups – quintiles as shown in Table 1, where in 2007 inhabitants of Quintile 1 consume 1.3 times more bread and cereals than Quintile 5, while Quintile 5 consumes 1.2 times more meat and meat products.

Nevertheless, increasing trend of meat consumption shows that well-being level of the society increase. Swedish researchers (Carlsson-Kanyama, Linden, 2001) consider that the increased consumption of meat and a more global food supply have contributed negatively. An increased interface with foreign food cultures through travelling and immigration are the main causes of these consumption changes. They forecast that meat consumption may decline while the consumption of organic and convenience foods may increase in the future. Moreover, there are many reports (Tailor et al., 2007) that have stressed negative impact of meat, particularly red meat, consumption on human health.

In Latvia the consumption of different kind of meat had been changed in the past ten year's period (1997-2007). Similarly the EU showed a move from beef and lamb to poultry (Devine, 2004), in Latvia consumption of beef has decreased (Figure 7); coefficient of determination is - R^2=0.80. Magdelaine P. and co-authors (Magdelaine et al., 2008) emphasise that poultry has become a mass consumer product throughout the world: in every region, in countries with very different levels of development, and in diverse forms. The highest consumption rates have been recorded in industrialised Western countries, with the USA ranking first and the European Union (25 member states) ranking fifth (22.7 kg/capita/year in 2004; 22.9 kg/capita in 2005; 22.2 kg/capita in 2006). However, in Latvia a per capita consumption of poultry is considerably lower, for instance in 2007 - 9.48 kg/year, though increasing trend has been observed from 1997 to 2007 (Figure 7), where the coefficient of determination is – R^2=0.69. However, per capita consumption of pork shows the highest increasing trend from 12.85 kg/year in 1997 to 21.6 kg/year in 2007 (R^2=0.93).

The researchers (Popkin et al., 1996) consider that the measurement of fruit and vegetable intake is critical for monitoring dietary trends. Although the WHO (WHO Regional Office for Europe, 2006) and the Ministry of Health, Republic of Latvia (Veselības ministrija, 2008) recommend an intake of more than 400 g of vegetables (in addition to potatoes) and fruit per day. Vegetables and fruit protect against cardiovascular diseases and cancers. But only 17 countries in the WHO European Region had enough fruit and vegetables available to meet this recommendation in 2003.

The results (Similä, 2003) of previous studies of fresh vegetable and fruit consumption in the countries of the Baltic Sea region show that in Latvia daily intake of fruit and vegetables is the lowest. The author estimates some trends of these product groups in the nutrition of Latvian population. The results show that



Source: author's calculations based on the data from the Central Statistical Bureau

Figure 8. **The trends of different plant origin food product consumption (kg/person/year) in Latvian households between 2000 and 2007**

Table 2

Per capita consumption (g/day) of fresh fruit and vegetables in Latvian households by quintiles in 2007

Products	Quintiles					Average
	1	2	3	4	5	
Fresh fruit	125	177	176	172	157	161
Fresh vegetables	68	100	119	134	162	116
Total	193	277	296	306	320	277

Source: author's calculations based on the data from the Central Statistical Bureau

consumption of these products in Latvia are less than in other EU countries, and less recommended volumes and proportion in total food daily intake (Table 2). Evaluating the trend of different plant origin product consumption in Latvia, the author's calculations (Figure 8) show that fruit consumption has increased, vegetables consumption more or less stays stable, but the consumption of potatoes has decreased.

Conclusions and proposals

The per capita expenditures for food show rising trend in Latvian households, but decreasing trend of the share of food expenditures. The difference in the expenditures and the share of food between low-income and high-income households remains constant.

Nevertheless the consumption per capita of bread and cereals in Latvia has decreased bread and cereal products still play quite important role in the nutrition in the lowest income group of population.

In Latvia the consumption of meat and meat products considerably increases and the consumption of different kind of meat has changed in the past ten year's period, where the consumption of poultry has increased, while beef – decreased.

Assessing the consumption of different food groups among household's income groups, the author concluded that there were differences in the consumption of different food groups and products. At the present stage of state development income is the factor leading to diversity of nutrition.

Therefore, future research challenges will be to estimate more deeply consumption and nutrition trends and patterns in Latvia, using new methodologies and methods, and taking into account lifestyle changes, health and environmental concerns etc.

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Kopsavilkums

Pārtikas patēriņa pētījumi ir plaši izplatīti un to nozīme un svarīgums arvien pieaug, jo tie ir nepieciešami starptautiskās un nacionālās politikas, kas skar sabiedrības labklājību, un ar to saistīto ekonomisko instrumentu izstrādē. Rakstā izklāstīti galvenie pētījuma rezultāti par pārtikas patēriņa problēmām Latvijā. Izklāstīti iegūtie rezultāti, vērtējot izdevumus un to tendences pārtikas, tai skaitā atsevišķu pārtikas produktu grupu, iegādei, kā arī šo izdevumu īpatsvaru un tā tendences kopējā patēriņā pēc dažādiem ienākuma līmeņiem (kvintiles). Bez tam ir sniegts dažādu pārtikas produktu grupu kvantitatīvais novērtējums un analizētas tā tendences kopumā un dažādās ienākumu grupās (kvintilēs). Īpaša vērība veltīta maizes un graudaugu, gaļas un gaļas produktu un augļu un dārzeņu grupām. Pētījuma rezultāti liecina, ka pārtikas iegādei izlietoto līdzekļu apjoms pieaug, vienlaicīgi samazinoties tā īpatsvaram kopējo mājsaimniecību izdevumu struktūrā. Joprojām trūcīgāko mājsaimniecību (1. kvintile) locekļu patēriņa izdevumu struktūrā ievērojams īpatsvars ir izdevumi pārtikai (2007. gadā - 35%), kas ir gandrīz divas reizes augstāks nekā labāk nodrošinātajās (2007. gadā – 18%). Konstatēts, ka maizes un graudaugu produktu patēriņš, kaut gan kopumā ir samazinājies, tomēr trūcīgāko iedzīvotāju pārtikas patēriņa struktūrā joprojām ieņem nozīmīgu vietu. Gaļas un gaļas produktu patēriņš ir paaugstinājies un mainījusies tā struktūra, samazinoties liellopu gaļas un palielinoties putnu gaļas patēriņam. Rezultāti liecina, ka pārtikas patēriņa tendences ir līdzīgas tām, kas novērotas pasaulē un Eiropā.

Atslēgas vārdi: pārtikas patēriņš, mājsaimniecība, ienākumi, kvintile, Latvija.

Biogāzes ražošana no lauksaimnieciskās ražošanas produktiem
Biogas Generation of Agricultural Manufacturing Products

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Abstract
World oil and natural gas resources are limited and are running out quickly. Therefore the topic of the day is the use of alternative energy resources that in the near future could replace the current energy resources. The use of alternative energy resources for Latvia could solve very constructive economic problem – dependency on foreign country energy resource providers. One of the newest and effective energy resources is biogas, which can be used in thermal energy, electric energy production, and as a vehicular fuel.
This article shows the exploration of biogas production perspectives and potential to be used from agricultural products obtained in Latvia, of which corn ensilage is the most effective one. Since Latvia has huge areas of uncultivated farmland, these areas can be used for efficient corn growing, from which biogas would be obtained, and then reprocessed into electric energy. The statistics show that using 140 thousand hectares or 10% of the European Union agricultural spaces of Latvia for corn growing; the potential biogas gain would be at least 564 million m^3. Reprocessing this amount of biogas, it would be possible to gain 1.184 billion kWh electric energy, which let us replace at least 20% of the imported electric energy, and reduce Latvia's dependency on foreign country electric energy providers**.**
Key words: biogas, biomass, electric energy, energetic cultivated plants.

Ievads
Pasaules ekonomika šobrīd piedzīvo sen nepieredzētu ekonomisko lejupslīdi, kas atstāj negatīvu iespaidu praktiski uz jebkuras valsts tautsaimniecību. Ekonomiskās lejupslīdes apstākļos sevišķi aktualizējas jautājums par ikvienas valsts neatkarību enerģētikas nodrošinātības ziņā. Situācija Latvijā ir tāda, ka mums nav ne savu naftas resursu, ne savas dabasgāzes. Arī ar iekšzemē saražotu elektroenerģiju Latvijas tautsaimniecība nav nodrošināta pilnībā – 2007. gadā vairāk nekā 85 % no patērētās elektroenerģijas tika importēta no kaimiņvalstīm, turklāt energoresursu importam ir tendence pieaugt. Lai šo negatīvo tendenci mazinātu, ir būtiski attīstīt alternatīvo energoresursu, piemēram, biogāzes ražošanu un izmantošanu Latvijas tautsaimniecībā.

Zinātniskā raksta mērķis – izpētīt biogāzes ražošanas iespējas un potenciālu Latvijā no lauksaimnieciskās ražošanas produktiem, kā arī noteikt biogāzes ražošanas nozīmi tautsaimniecībā.

Zinātniskā raksta mērķa sasniegšanai izvirzītie uzdevumi:
1) koncentrētā veidā apkopot un izanalizēt teorētisko informāciju un statistikas datus par biogāzes ražošanas iespējamajiem izejmateriāliem un potenciālu;
2) balstoties uz ārvalstu un Latvijas enerģētikas un lauksaimniecības ekspertu pieredzi, noteikt piemērotāko lauksaimniecības kultūraugu biogāzes ražošanai Latvijas apstākļos;
3) veikt aprēķinus par biogāzes ieguves apjomiem no teorētiski izdevīgākā lauksaimniecības kultūrauga biomasas.

Lai apspriestu izvirzītā mērķa un tam pakārtoto uzdevumu diskutablos jautājumus, autori izmantos analīzes un sintēzes un monogrāfisko pētījumu metodes, lai novērtētu biogāzes ražošanas iespējamo resursu potenciālu un ieguves apjomus, tiks izmantotas dinamisko laikrindu un ekonomiski matemātiskās analīzes metodes.

Raksta tapšanā ir izmantoti Latvijas Republikas Centrālās statistikas pārvaldes dati, Vides ministrijas informācija, Latvijas un ārvalstu zinātnieku pētījumu rezultāti, par pamatu ņemot akadēmiķa Arņa Kalniņa ar tēmu saistītās atziņas.

1. Biogāzes ražošanas iespējas, nozīme un potenciāls Latvijā
Biogāze dabā veidojas, organiskajām vielām sadaloties anaerobos apstākļos, tādās vietās kā purvi, ūdenstilpņu krasta zonas, dūņas, dzīvnieku gremošanas sistēmas. Biogāzes sastāvā 50-70 % ir metāns (CH_4), 30-40 % oglekļa dioksīds (CO_2), un

mazāki apjomi citas gāzes. (Biogāzes ražošanas un..., 2007.)

Biogāzes ieguves potenciālie avoti var būt:

1) bioloģiski noārdāmie sadzīves atkritumi;
2) aktīvās dūņas;
3) atbilstoši apstrādāti cūku un liellopu kūtsmēsli;
4) dzīvnieku izcelsmes atkritumi;
5) pārtikas rūpniecības ražošanas blakusprodukti un organiskie atkritumi;
6) zaļā masa. (Atjaunojamo energoresursu izmantošanas..., 2006.)

Ļoti būtisks biogāzes ražošanu veicinošs faktors ir tas, ka Latvija, iestājoties Eiropas Savienībā, ir apņēmusies 2010.gadā ar atjaunojamiem resursiem saražot 49.3% no valsts iekšzemes elektroenerģijas patēriņa, kur kaut arī nelielu, tomēr pastāvīgu daļu varētu veidot no lauksaimniecības biomasas iegūtā enerģija. (Atjaunojamie energoresursi Latvijā..., 2008.)

Biogāzes ražošana pašreiz kļuvusi par vienu no visperspektīvākajiem energoresursu veidiem Latvijā. Latvijas Republikas Vides ministrija ir izstrādājusi Biogāzes ražošanas un izmantošanas programmu 2007.-2011. gadam, kas paredz 2011. gadā saražot 13 miljonus kubikmetru biogāzes. (Gaile, Z., 2008.)

Lai to nodrošinātu, ir izstrādāti sekojoši valsts atbalsta mehānismi biogāzes ieguvei un elektroenerģijas ražošanai:

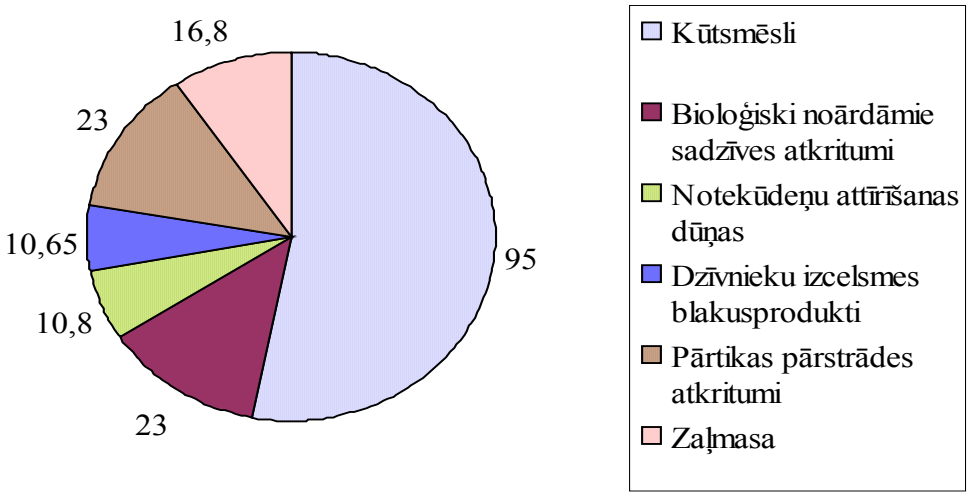
- Zemkopības un Ekonomikas ministrija no Eiropas Savienības finanšu atbalsta instrumentiem piešķirs līdzfinansējumu (aptuveni 40 procentu) realizējamiem projektiem;
- Vides ministrija no līdzekļiem, kas iegūti no valstij piederošo oglekļa dioksīda nosacītā daudzuma vienību pārdošanas, piešķir līdzfinansējumu projektiem, kuru mērķis ir elektroenerģijas ražošana no biomasas;
- tiek garantēta dubultā tarifa piemērošana elektroenerģijas ieguvei no biomasas turpmāko 10 gadu laikā, pēc tam tiek garantēta iepirkšana 50 % apmērā no dubultā tarifa. (Gāze un nauda no govs mēsliem, 2008)

Pamatojoties uz statistisko informāciju un dažādiem aprēķiniem par lauksaimnieciskās produkcijas un blakus produkcijas apjomiem, kā arī citu bioloģiski noārdāmo atkritumu apjomiem Latvijā, ir aprēķināts, ka pašreizējie nosacītie apjomi sastāda ap 174 miljonus m³ saražotās biogāzes gadā. (Biogāzes ražošanas un..., 2007.)

Kā redzams 1.1. attēlā, tad lielākais biogāzes ražošanas potenciāls Latvijā saistās ar lauksaimniecisko ražošanu. Pārstrādājot lauksaimnieciskās ražošanas produktus un blakusproduktus (kūtsmēslus un zaļmasu) kopējais iegūtais biogāzes apjoms būtu 111.8 miljoni kubikmetru biogāzes, kuru iespējams izmantot siltumenerģijas ražošanai, elektroenerģijas ražošanai un kā transportlīdzekļu degvielu.

Enerģētisko kultūraugu audzēšana biogāzes ražošanas vajadzībām palīdz risināt vairākas būtiskas problēmas vienlaicīgi:

1) nodrošina racionālu neizmantoto lauksaimniecībā izmantojamo zemju izmantošanu;
2) dod ieguldījumu alternatīvās enerģijas ražošanā, kas jānodrošina ikvienai Eiropas Savienības dalībvalstij saskaņā ar Eiropas Savienības direktīvām, lai sasniegtu izvirzītos stratēģiskos mērķus enerģētikas jomā;
3) samazina Latvijas enerģētikas nozares atkarību no ārvalstu, sevišķi, Krievijas energoresursiem;



Avots: Biogāzes ražošanas un izmantošanas attīstības programma 2007.-2011. gadam

1.1.att. **Biogāzes potenciāls Latvijā pēc pārstrādājamo materiālu veidiem, miljonos m³ gadā**

4) nodrošina lauksaimniekiem alternatīvu ienākumu gūšanas iespēju – gan realizējot iegūto biomasu, gan saņemot Eiropas Savienības atbalsta maksājumus par enerģētisko kultūraugu platībām;
5) nodrošina augseku, kas ir viens no labas lauksaimniecības prakses priekšnosacījumiem.

Latvijas lauksaimniekiem un visai lauksaimniecības nozarei svarīga ir lauksaimniecībā izmantojamās zemes racionāla un efektīva izmantošana, kurai pakārtota alternatīvu ienākumu gūšanas iespēja, kas dod labumu visai Latvijas tautsaimniecībai kopumā.

Saskaņā ar Eiropas Savienības attiecīgajiem tiesību aktiem daļa lauksaimniecības zemju Eiropas valstīs tiek atstāta atmatā ar mērķi ierobežot lauksaimnieciskās ražošanas pārprodukciju. Tomēr šos laukus drīkst izmantot biomasas ražošanai, kā zāle, kukurūza, lopbarības bietes un citiem, ko savukārt iespējams pārstrādāt biogāzes ražotnēs enerģijas iegūšanai. Šī prakse tiek arvien plašāk piemērota Eiropas valstīs. Latvijā situācija šobrīd ir nedaudz atšķirīga. Lauksaimnieki saņem vienoto platības maksājumu par lauksaimniecībā izmantojamo zemi, kā arī tiešos maksājumus atkarībā no audzējamās kultūras. (Biogāzes ražošanas un..., 2007.)

Eiropas Savienības kopējās lauksaimniecības politikas nostādnes paredzēja, ka laika posmā no 2007. līdz 2009. gadam jāievieš vienotais saimniecības maksājums, kura apjoms atkarīgs no saimniecības platības. Tomēr Latvijas lauksaimnieku un Zemkopības ministrijas ierēdņu diskusiju rezultātā, izvērtējot esošo situāciju lauksaimniecības nozarē, tika nolemts, ka šis ieviešanas periods Latvijā tiek pagarināts līdz 2011. gadam. (KLP reformas vienotā..., 2008.)

Ieviešot vienoto saimniecības maksājumu, obligāta papildus prasība būs neaudzēt pārtikā vai lopbarībā izmantojamās kultūras uz vismaz 10 % saimniecības zemes. Tomēr šajos 10 % zemes būs atļauts audzēt energokultūras, par to audzēšanu saņemot papildus tiešo maksājumu. Tā kā Latvijā šobrīd Eiropas Savienības deklarētā lauksaimniecības platība ir 1.4 miljoni hektāru, veidojas jaunas iespējas energokultūru audzēšanai 140 tūkstošu hektāru platībā. (Biogāzes ražošanas un..., 2007.)

Tomēr tas neatspoguļo patieso energokultūru audzēšanas potenciālu - šie 140 tūkstoši hektāru, ir tikai tā platība, par kuru Latvijas lauksaimnieki saņemtu valsts un Eiropas Savienības atbalsta maksājumus, bet Latvijā ir vairāk nekā 1.4 miljoni hektāru neizmantoto lauksaimniecībā izmantojamo zemju, kas nav deklarēti, bet kurus var lietderīgi izmantot energokultūru audzēšanai.

Zemes sadalījums pēc zemes lietošanas mērķiem Latvijā uzskatāmi parādīts 1.1. tabulā.

Izpētot Latvijas Republikas Centrālās statistikas pārvaldes datu bāzes sniegto informāciju, galvenais secinājums ir tāds, ka vēl joprojām Latvijā ir liels neizmantotās lauksaimniecībā izmantojamās zemes īpatsvars. 2007. gadā lauksaimniecībā neizmantoto zemju platības ir pieaugušas par 6000 ha, salīdzinot ar 2006. gadu. Ņemot vērā slikto ekonomisko situāciju Latvijā (par to liecina augstais inflācijas rādītājs un iekšzemes kopprodukta pieauguma tempu samazinājums), kā arī Latvijas politiķu nespēju pilnvērtīgi aizstāvēt Latvijas lauksaimnieku nacionālās intereses Eiropas Savienības mērogā (Latvijas lauksaimnieki saņem vismazākos atbalsta maksājumus, kas ir tikai 1/3 daļa no vidējā atbalsta maksājumu apjoma Eiropas Savienībā), var prognozēt, ka šīs platības turpmākajos gados pieaugs. Neizmantoto lauksaimniecībā izmantojamo zemju platības ir iespējams efektīvi izmantot zaļās masas (biomasas) iegūšanai, no kuras var ražot biogāzi. Lai to realizētu, Latvijas politiķiem ir jāpanāk deklarēto platību pārskatīšana Eiropas Savienības mērogā, jo 2007. gadā izmantotā lauksaimniecībā izmantojamo zemju platība pārsniedza 1.8 miljonus hektāru,

1.1. tabula

Zemes sadalījums pēc zemes lietošanas mērķiem Latvijā laika posmā no 2003. – 2007. gadam, tūkstoši hektāru

Zemes sadalījums	2003	2004	2005	2006	2007
Izmantotā lauksaimniecībā izmantojamā zeme:	1 581.8	1 642.1	1 733.7	1 855.3	1 839.2
• aramzeme	956.4	1 008.6	1 091.8	1 205.1	1 188.1
• ilggadīgie stādījumi	12.0	12.40	12.80	13.20	10.0
• pļavas un ganības	613.0	620.9	628.9	636.8	641.0
Meži	2 877.2	2 885.5	2 904.4	2 918.2	2 929.0
Neizmantotā lauksaimniecībā izmantojamā zeme	1 770.0	1 701.4	1 590.9	1 450.8	1 456.8

Avots: Latvijas Republikas Centrālās statistikas pārvaldes dati

kas nozīmē atbalsta maksājumu proporcionālu samazinājumu Latvijas lauksaimniekiem.

2. Biogāzes ražošana no kukurūzas substrāta un iespējamie apjomi Latvijā

Lai izprastu, kā efektīvāk apsaimniekot neizmantotās lauksaimniecībā izmantojamās zemju platības, svarīgi zināt, kādu biogāzes daudzumu ir iespējams iegūt no dažādiem biomasas substrātu veidiem.

Šim nolūkam var izmantot Vācijā pielietojamos normatīvus (skatīt 2.1. tabulu), kas ļauj kalkulēt izmaksas un ieņēmumus no biogāzes ražošanas, kā arī veidot loģistiku. Dažādos pētījumos konstatēts, ka daudzas augu sugas ir piemērotas biogāzes ražošanai, bet Vācijā un Austrijā secināts, ka vispiemērotākā ir kukurūza, kas ļauj iegūt vislielāko metāna iznākumu no 1 hektāra. (Gaile, Z., 2008., 26. lpp.)

Kā redzams 2.1. tabulā, no vienas tonnas kukurūzas skābbarības var iegūt 170-200 m^3 biogāzes ar metāna saturu 50-55 %. Līdzīgu biogāzes daudzumu var iegūt arī no graudaugu skābbarības, kā arī zā1āju skābbarības, tomēr graudaugu un zālāju skābbarības iznākums no 1 hektāra nav tik liels, kā kukurūzai. Turklāt graudaugiem ir būtiska nozīme valsts pārtikas apgādē, kas ir racionālāks graudaugu izmantošanas veids, ņemot vērā pārtikas trūkuma problēmu globālā mērogā.

Biogāzes ražošanai no kukurūzas var izdalīt 4 fāzes:

1) kukurūzas izaudzēšana (biomasas saražošana);
2) kukurūzas novākšana, kvalitatīva sasmalcināšana un konservēšana (skābbarības gatavošana);
3) biogāzes ieguve kukurūzas biomasas fermentācijas procesā;
4) gala produktu (biogāze un digestāts) izmantošana.

Gala produktu daudzums un kvalitāte pilnībā ir atkarīga no pirmo 3 fāžu norises, tomēr par svarīgāko uzskatāmi apstākļi, kādos kukurūza tiek izaudzēta (1. fāze). Gan ārvalstu, gan Latvijas pētnieki par svarīgiem faktoriem kukurūzas audzēšanā un līdz ar to biogāzes iznākumā atzinuši:

- kukurūzas šķirnes izvēle;
- meteoroloģiskie apstākļi konkrētajā ražas gadā;
- kukurūzas novākšanas laiks. (Gaile, Z., 2008., 28. lpp.)

Ņemot vērā to, ka kukurūzas biomasas iznākums atkarīgs no meteoroloģiskajiem apstākļiem, tad Latvijā nav iespējams efektīvi izmantot visas tās pašas šķirnes, ko audzē citās valstīs Eiropā. Rēķinot arī potenciālo biogāzes apjomu no 1 hektāra, jāņem vērā, ka Latvijā vidējā ražība ir zemāka nekā Vācijā un Austrijā, kur

2.1. tabula

Biogāzes aptuvenais iznākums no atsevišķiem raksturīgākajiem substrātiem

Substrātu veidi	Biogāzes ieguve kubikmetros no vienas substrāta tonnas, m^3/t	Sausnas īpatsvars substrāta, %	Metāna (CH_4) saturs iegūtajā biogāzē, %
Liellopu šķidrmēsli	20-30	8-11	60
Cūku šķidrmēsli	20-35	ap 7	60-70
Liellopu kūtsmēsli	40-50	25	60
Cūku kūtsmēsli	55-65	20-25	60
Putnu mēsli /divos variantos/	70-80 55-60	32 15	65 60
Kukurūzas skābbarība	170-200	20-35	50-55
Graudaugu skābbarība	170-220	30-40	55
Cukurbietes	170-180	23	53-54
Biešu lapas	70	16	54-55
Zā1āju skābbarība	170-200	25-50	54-55
Ražošanas procesa ūdeņi	55-65	1,6	50-60
Rapša rauši, auksti presētie, 15% tauki	580	91	62
Melase	290-340	80-90	70-75

Avots: Kalniņš A., 2007., 70. lpp.

kukurūzas audzēšanai ir labvēlīgāki apstākļi. Tomēr izmantojot Latvijas apstākļiem piemērotas kukurūzas šķirnes, piemēram, „Beethoven", „Suprise", „Tango" ir iespējams iegūt zaļmasas vidējo ražu 40 tonnas no hektāra.

Potenciālais iegūstamās biogāzes apjoms ar ražību 40 tonnas no hektāra:

$40\ t \times 190\ m^3/t = 7600\ m^3$ biogāze / ha

Potenciālais metāna apjoms, ko var izmantot elektroenerģijas, siltumenerģijas ražošanai vai kā biodegvielu transportlīdzekļos:

$7600\ m^3 \times 0.53 = 4028\ m^3$ metāns / ha

Aprēķinos izmantoti vidējie rādītāji. Labvēlīgos apstākļos iegūtais metāna apjoms no 1 hektāra kukurūzas sējumu iespējams arī lielāks. Līdz ar to var secināt, ka Latvijā pastāv iespējas efektīvi ražot biogāzi no kukurūzas biomasas, taču nepieciešams palielināt kukurūzas sējumu platības.

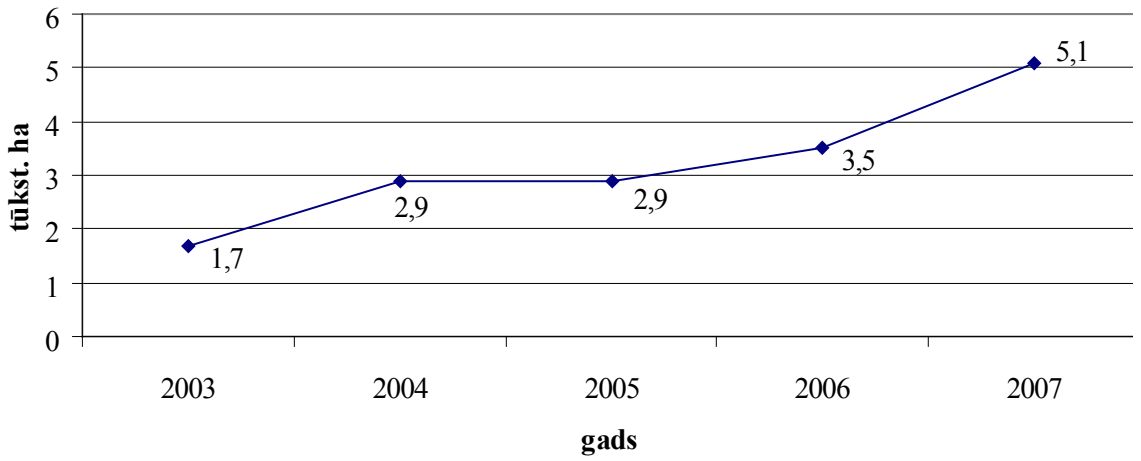
Kā liecina Centrālās statistikas pārvaldes dati (skatīt 2.1. attēlu), kukurūzas sējumu platības ik gadu ir pieaugušas, tomēr tas ir skaidrojams ar lopu skaita palielināšanos valstī, jo līdz 2007. gada beigām Latvijā neviena biogāzes ražotne, kurai potenciālā biomasa vai kā piemaisījums biomasas substrātā būtu kukurūza, vēl savu darbību nebija sākusi.

Ar kukurūzas audzēšanu Latvijas lauksaimnieki nodarbojas galvenokārt skābbarības iegūšanas nolūkos, ko paredzēts izmantot lopbarībai, tāpēc ar kukurūzu 2007. gadā bija apsēts 5.1 tūkstotis hektāru, kas ir tikai 0.28 % no kopējās, izmantotās lauksaimniecībā izmantojamo zemju platības šajā gadā, tomēr tas ir 3 reizes vairāk kā 2003. gadā apsētās platības. Attīstoties biogāzes ražošanai, gaidāms kukurūzas platību pieaugums, jo lauksaimniecības eksperti Vācijā ir pārliecinājušies par kukurūzas potenciālu biogāzes ražošanā. Turklāt pozitīvs, kukurūzas audzēšanu veicinošs faktors ir tas, ka nav jāievēro augu seka. Augu seka jeb sējas kārtība ir kultūru sekošana noteiktā vietā un noteiktā laikā, saistīta ar noteiktiem agrotehnikas paņēmieniem. (Apsīts, J., 1943., 353. lpp.) Kukurūza ir kultūraugs, kas pacieš bezmaiņas audzēšanu, ja tiek nodrošināta rūpīga augsnes apstrāde, pilnvērtīgs mēslojums, savlaicīga sējumu kopšana, efektīva nezāļu apkarošana**.** (Latvijas lauksaimniecības zinātniskie..., 1999.) Tas nozīmē, ka kukurūzu var sēt atkārtoti vienā un tajā pašā laukā vairākus gadus pēc kārtas, kas ļauj specializēties konkrēti šī viena kultūrauga audzēšanā.

Latvijas Republikas Vides ministrijas izstrādātās Biogāzes ražošanas un izmantošanas programmas 2007.-2011. gadam izvirzītos mērķus, kas paredz 2011. gadā saražot Latvijā 13 miljonus kubikmetru biogāzes, var sasniegt attīstot kukurūzas audzēšanu un izveidojot jaunas biogāzes ražotnes.

Balstoties uz iepriekš veiktajiem aprēķiniem un pieņemot, ka no viena hektāra kukurūzas platību Latvijas apstākļos iespējams iegūt vidēji 4028 kubikmetru metāna gāzes, var aprēķināt, cik liela platība Latvijas lauksaimniecībā izmantojamo zemju būtu jāatvēl kukurūzas audzēšanai, lai sasniegtu Biogāzes ražošanas un izmantošanas programmas 2007.-2011. gadam izvirzītos rezultatīvos rādītājus.

Kā redzams 2.2. tabulā, lai 2011. gadā saražotu 13 miljonus, kubikmetru gāzes nepieciešami papildus 3228 hektāri kukurūzas platību, kas ir apmēram tikai 2.3 % no tām platībām, kuras 2011. gadā, ieviešot vienoto saimniecības maksājumus, nedrīkstēs izmantot pārtikā vai lopbarībā izmantojamo kultūraugu audzēšanai. Šajās platībās būs atļauts audzēt energokultūras, par to audzēšanu saņemot papildus tiešo maksājumu.



Avots: Latvijas Republikas Centrālās statistikas pārvaldes dati

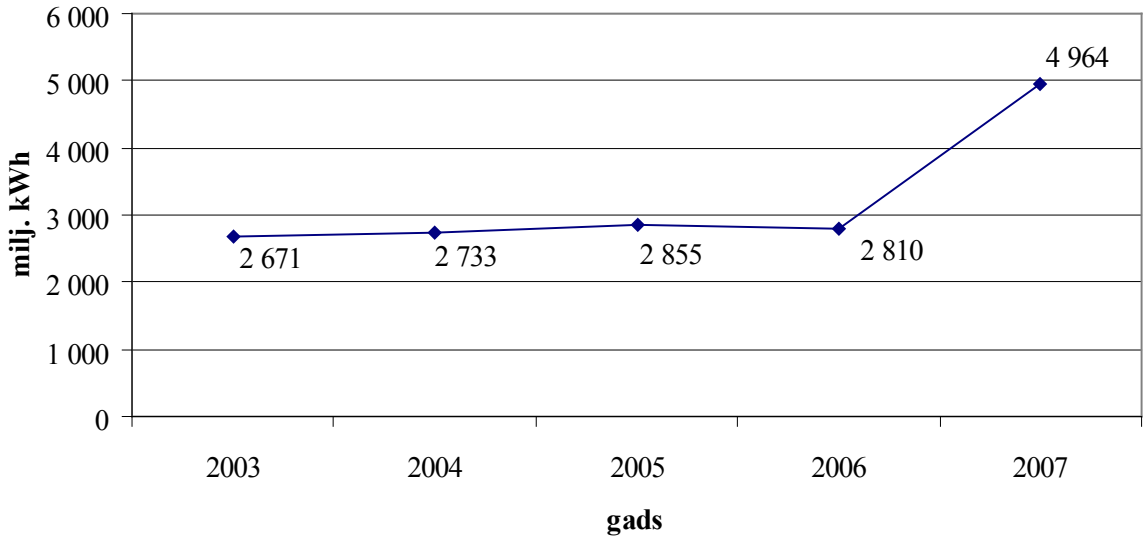
2.1. att. **Kukurūzas sējumu platība (tūkst. ha) Latvijā laika posmā no 2003. līdz 2007. gadam**

2.2. tabula

Biogāzes apjoms un biogāzes ražošanai nepieciešamās kukurūzas sējumu platības 2009. – 2011. gadā

Rādītāji	2009	2010	2011
Saražotais biogāzes apjoms, m^3/ gadā	9 000 000	11 000 000	13 000 000
Nepieciešamā kukurūzas sējumu platība, ha	2235	2731	3228

Avots: Biogāzes ražošanas un izmantošanas attīstības programma 2007.-2011. gadam un autoru aprēķini



Avots: Latvijas Republikas Centrālās statistikas pārvaldes dati

2.2. att. **Elektroenerģijas imports Latvijā laika posmā no 2003. līdz 2007. gadam**

Izmantojot visus 10% jeb 140 tūkstošus hektāru no Eiropas Savienībā deklarētajām lauksaimniecības platībām kukurūzas audzēšanai, potenciālais iegūtās biogāzes apjoms būtu gandrīz 564 miljoni kubikmetru biogāzes. Izmantojot šo biogāzes apjomu, koģenerācijas procesā pie lietderības koeficienta 40 % iespējams iegūt apmēram 1.184 miljardus kWh elektroenerģijas, kas ir 20% no Latvijas tautsaimniecībā nepieciešamā elektroenerģijas kopapjoma gadā.

Biogāzes ražošana no izaudzētās kukurūzas dotu iespēju mazināt Latvijas atkarību no elektroenerģijas importa, kas sevišķi strauji pieaudzis 2007. gadā.

Kā redzams 2.2. attēlā, importētās elektroenerģijas apjoms sevišķi pieaudzis 2007.gadā – pieaugums 77 % apmērā pret 2006. gadu. Ja šāda tendence turpināsies, tad Latvijas enerģētikas nozares atkarība no ārvalstu piegādātājiem vēl vairāk pasliktinās ekonomisko situāciju tautsaimniecībā.

Izmantojot 140 tūkstošus hektāru lauksaimniecībā izmantojamo zemju kukurūzas audzēšanai un biogāzes ražošanai, Latvija var aizstāt vismaz 23 % no importētās elektroenerģijas, bet izmantojot vēl 39 % no Latvijā neizmantotajām lauksaimniecībā izmantojamām zemēm enerģētisko kultūraugu, piemēram, kukurūzas audzēšanai, būtu iespējams pilnībā nodrošināt tautsaimniecību ar Latvijā ražotu elektroenerģiju.

Jāņem vērā, ka Latvijā ir arī vairāk nekā 1.4 miljoni hektāru lauksaimniecībā izmantojamās zemes, kas netiek izmantotas (nedeklarētas platības), tās daļēji arī būtu iespējams izmantot enerģētisko kultūraugu audzēšanai. Taču, protams, vēlams, lai Latvijas atbildīgās institūcijas, panāktu deklarēto platību palielinājumu atzinumu Eiropas Savienības instancēs, tādejādi lauksaimnieki saņemtu atbalsta maksājumus par šīm platībām, kas kukurūzas audzēšanu padarītu rentablāku un veicinātu biogāzes ražošanas ilgtermiņa attīstību Latvijā.

Rakstā analizētie jautājumi ir diskutējami un prasa turpmākus pētījumus, pilnīgākus ekonomiskos aprēķinus, lai noteiktu biogāzes ražošanas iespējas no kukurūzas vai citiem lauksaimnieciskās ražošanas produktiem, izvērtējot šos procesus ilgtspējības

aspektā, tas ir ņemot vērā ne tikai ekonomisko izdevīgumu, energo neatkarības iespējamību Latvijai, bet arī vides resursu saglabāšanu un cilvēku labklājības nodrošinājumu, neradot draudus nākošajām paaudzēm.

Secinājumi

1) Latvijā ir lielas perspektīvas biogāzes ražošanai no lauksaimnieciskās ražošanas produktiem, jo:
   - Latvijas Republikas Vides ministrija ir izstrādājusi Biogāzes ražošanas un izmantošanas programmu 2007.-2011. gadam, kas paredz konkrētus pasākumus, lai 2011. gadā Latvijā tiktu saražoti 13 miljoni kubikmetru biogāzes;
   - ir izstrādāti valsts atbalsta mehānismi (līdzfinansējuma un elektroenerģijas, kas iegūta no biogāzes, iepirkuma tarifu veidā) biogāzes ražotņu projektu īstenošanai un biogāzes rentablai ražošanai;
   - ir vairāk nekā miljons hektāru lauksaimniecībā neizmantotās lauksaimniecībā izmantojamās zemju platības, kurās iespējams audzēt energokultūras;
   - ir elektroenerģijas deficīta pieaugums (elektroenerģijas importa apjoms 2007. gadā palielinājies par 77 %, salīdzinot 2006. gadu), kuru var kompensēt ar elektroenerģiju, kas iegūta no biogāzes koģenerācijas procesā.
2) Par izdevīgāko lauksaimniecības kultūraugu biogāzes ieguvei Latvijā uzskatāma kukurūza, jo:
   - ir relatīvi liels biogāzes iznākums no vienas vienības (170-200 m^3/t);
   - nav jāievēro specifiska augu seka, veicina specializāciju, samazina izmaksas;
   - iespējams iegūt biomasu vismaz 40 t/ha apmērā.
3) Izmantojot 10% jeb 140 tūkstošus hektāru no Eiropas Savienībā deklarētajām Latvijas lauksaimniecības platībām kukurūzas audzēšanai, potenciālais iegūtās biogāzes apjoms būtu vismaz 564 miljoni m^3 biogāzes, no kuras iespējams iegūt 1.184 miljardus kWh elektroenerģijas, kas ļauj aizstāt vismaz 20 % no importētās elektroenerģijas un mazināt Latvijas atkarību no ārvalstu piegādātājiem.

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Vietējiem resursiem atbilstošas biomasas izmantošana koģenerācijas iekārtās Latvijā
Use of Biomass Adequate to Local Resources in Cogeneration Facilities in Latvia

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Abstract
At the current economic situation, it is necessary to ensure sustainable development of Latvia's power sector, since now Latvia imports up to 70% of the required energy resources. The use of local biomass in cogeneration facilities would greatly increase Latvia's energy independence. The paper provides the discussion of factors, and availability of local resources and competitive price for sustainable development of Latvia's power sector.
The least energy loss, when processing forest biomass, is monitored in the production of granules and woodchips. There is a great amount of energy-wood in Latvia. It is possible to produce 8 million MWh of energy per year if Latvia's exported energy-wood is used in local cogeneration facilities. Properly and rationally processed logging scraps can be used to produce an extra 12.5 million MWh of energy, thus slightly decreasing the import of energy resources. Thermal energy producers using woodchips instead of gas can save up to LVL 456 per day to produce 1 MWh of heat. These thermal energy producers which use woodchips instead of gas provide lower heat tariffs and make rational usage of local resources possible, thus increasing Latvia's energy independence.
Key words: local biomass, woodchips, cogeneration, energy independence.

Ievads
Katras valsts ekonomiskā attīstība ir saistīta ar enerģētisko drošību un stabilitāti, kas izpaužas kā spēja sevi iekšēji nodrošināt ar nepieciešamajiem enerģijas resursiem. Latvija 2007.gadā pati saviem spēkiem nodrošināja tikai 28.8% no kopējā patērētās enerģijas daudzuma, tātad - valsts ir energoatkarīga. (Jānis K., 2008)

Kā uzsver Bonifacio Garcia Porras (ES Enerģētikas komisāra A.Piebalga biroja loceklis) un Uģis Sarma (LR Ekonomikas ministrijas Enerģētikas departamenta direktors), patreiz Latvijai ir būtiski nodrošināt enerģētikas ilgstspējīgu attīstību. Lai to izdarītu, ir jānodrošina savstarpēja mijiedarbība starp trīs faktoru kopumu: enerģētikas pieejamību, konkurētspējīgu cenu un vides aizsardzību. Turklāt minētie faktori nemainās, mainās tikai to proporcijas noslēgtas sistēmas robežās. Neskatoties uz to, ka faktori, kuri ietekmē enerģētikas ilgstspējīgu attīstību, ir trīs, šajā noslēgtajā sistēmā nepieciešams enerģētikas jautājumus risināt trīs līmeņos – ranžējot minētos faktorus: pirmkārt, sākt ar enerģijas pieejamību, otrkārt, konkurētspējīgu cenu un, treškārt, vides aizsardzību. Pēdējos 15 gados Latvijā kā noteicošais faktors bija izvirzīta cena, jo nafta maksāja tikai 10 līdz 12 dolārus par barelu, un gāzes piegādes no Krievijas bija lētas. Šāds scenārijs būtu bijis labs, ja tiktu ņemts vērā nosacījums, ka, ja par prioritāti tiek izvirzīts viens no šiem faktoriem, tad pārējie zaudē. Šajos 15 gados bija nepieciešams paralēli plānot enerģētikas pieejamības problēmas risināšanu, kas netika veikta pietiekošā apjomā. Piedevām enerģētikas pieejamības faktorā ietilpst arī apgādes drošība, kas vēl jo vairāk uzsver un pamato to, kādēļ nepieciešams panākt līdzsvaru starp šiem faktoriem, kuri pēc savas būtības ir pretrunīgi un varbūt pat nesavienojami. Patreiz Latvija nespēj nodrošināt enerģētikas ilgtspējīgu attīstību, jo netiek izmantota enerģijas piegādes avotu diversificēšana. Tas pamatojas arī ar tādu būtisku faktu, ka vairs nevar aplūkot kopējo Eiropas enerģijas tirgu kā vienu kopumu, jo tas ir fragmentēts, un Baltija tam ir spilgts piemērs – mums nav savienojumu ar Eiropas enerģijas tīkliem, līdz ar to piegādāju konkurence kā cenas regulēšanas mehānisms nedarbojas.

Latvijas Biomasas asociācijas valdes loceklis Didzis Palejs uzsver, ka trauksmes faktors ir starpvalstu politiskās attiecības, kuras Latvijas enerģētikā spēlē ļoti lielu lomu, tādēļ svarīgi ir samazināt enerģijas piegādes riskus un diversificēt enerģijas iegūšanas avotus. Patreiz lielākais ļaunums ir kā resursu izmantot gāzi, jo tas padara Latviju vēl vairāk atkarīgu no Krievijas. Ja diversifikācijas būtu par labu akmeņoglēm, tad tiktu nodrošināta izejvielu

diversificēšana un panākta lielāka neatkarība no Krievijas, kas būtu pozitīvs solis, savukārt iegūtās enerģijas izmaksas būtu līdzvērtīgas vietējās biomasas izmantošanai enerģijas ražošanā. Latvijai racionālākais variants ir izmantot tieši vietējos resursus, tādejādi kļūstot par gandrīz energoneatkarīgu valsti.

Ļoti nozīmīgs ir fakts, ka esošo finanšu krīzi nevarēs atrisināt, vienkārši fosilos resursus aizstājot ar atjaunojamiem – vērība ir jāpievērš biomasas kā atjaunojamā enerģijas avota izmantošanas efektivitātei. Nekompetents ir viedoklis, ka biomasa rodas no lauksaimniecības kā blakusprodukts, tāpēc to var izmantot visur, kur vien pastāv tāda iespēja. Balstoties uz faktu, ka atjaunojamo energoresursu apjoms 2020.gadā no 7% Eiropā jāpalielina līdz 20%, ir būtiski jāizvērtē biomasas gala produktivitāte atkarībā no izmantošanas iespējām. (Spunde I., 2008)

Izmantojot biomasu, koģenerācijas iekārtās ir iespējams saražot kā siltumu, tā nepieciešamo elektroenerģiju. Vislielākās koģenerācijas pielietošanas iespējas pastāv uzņēmumos, kuri nodarbojas ar siltumenerģijas ražošanu. Šādos uzņēmumos ražošanā izmantoto izejvielu sadārdzināšanās atstāj būtisku un tūlītēju ietekmi uz kopējo ekonomisko stabilitāti valstī. Līdz ar to, pētot enerģētikas ilgstspējīgu attīstību Latvijā, balstītu uz biomasas izmantošanu, nepieciešams noteikt racionālāko biomasas izmantošanas veidu, kuru ilgstoši būtu iespējams izmantot siltuma ražošanas uzņēmumos.

Hipotēze: Siltumražošanas uzņēmumos, kuri darbojas koģenerācijas režīmā, izmantojot Latvijai atbilstošāko biomasas veidu, ir iespējams panākt līdzsvaru starp resursa pietiekamību un konkurētspējīgu cenu, tādejādi būtiski palielinot Latvijas energoneatkarību.

Darba mērķis: Noskaidrot, kurš no biomasas izmantošanas veidiem ir vispiemērotākais Latvijai un praktiski to izvērtēt siltumenerģijas uzņēmumā, kurš darbojas koģenerācijas režīmā.

Darba uzdevumi:

1. Izanalizēt biomasas izmantošanas potenciālu, balstoties uz gala enerģijas zudumu atkarībā no izmantošanas veida, nosakot racionālāko.
2. Aplūkot racionālākā biomasas veida izmantošanas izdevīgumu siltumražošanas uzņēmumos.
3. Izvērtēt racionālākā biomasas veida ieguves resursu pietiekamību un tā ietekmi uz Latvijas enerģijas tirgu.

Darbā izmatotas analīzes, sintēzes, grafiskās un monogrāfiskās pētījumu metodes, lai novērtētu biomasas potenciālu, indukcijas un dedukcijas un ekonomiski matemātiskās analīzes metodes. Raksta tapšanā pamatā izmantoti Latvijas autoru darbi, konferences „Vide un enerģētika 2008" materiāli un ražošanas uzņēmuma „Latvijas siltums" nepublicētie dati, kā arī informācija no interneta resursiem.

Biomasas izmantošanas potenciāls

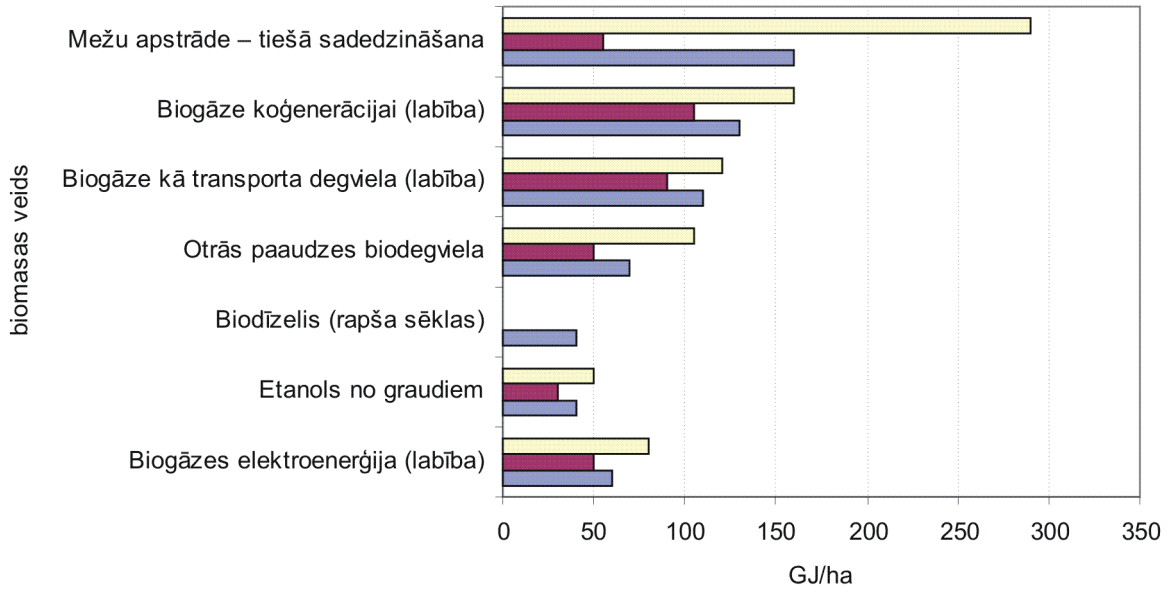
Patreizējās biomasas izmantošanas tendences Latvijā nosaka citu Eiropas valstu piemērs. Šāda prakse būtu vērtējama pozitīvi, ja vien biomasa kā energoresurss un enerģijas avots netiktu izmantota neefektīvi. Pamats tam ir politiskie faktori, kas veicinājuši biomasas primāro izmantošanu elektroenerģijas un biodegvielas ražošanai. Šie abi enerģijas pārvēršanas veidi radījuši biomasas potenciālos enerģijas zudumus - pat līdz 80%. Kļūdains bija viedoklis, ka biomasa lielākoties rodas no lauksaimniecības piedevām vairumā gadījumu kā blakusprodukts un neierobežotā apjomā.

Aplūkojot Vācijas ekspertu analīzes rezultātus (1.attēls), var secināt, ka vislielākā gala produktivitāte (enerģijas apjoms, kas iegūts no viena ha zemes mīnus visi enerģijas ieguldījumi) no biomasas rodas, ja tā tiek iegūta no 1 ha koksnes. Turklāt tehnoloģiju variācijas, kuras pastāv attiecīgajā gadījumā, ir ievērojami pārākas par pārējo biomasas veidu enerģijas gala produktivitātēm. Patreiz energoefektivitātei ir liela loma ekonomikā, un, vērtējot krasās energoefektivitātes starpības starp labākajiem biomasas izmantošanas veidiem, jāsecina, ka nav ekonomiski izdevīgi izmantot biomasu vienkārši tāpēc, lai sasniegtu atjaunojamo resursu izmantošanas normas, ja attiecīgais biomasas veids nedod maksimālu energoefektivitāti. (Spunde I., 2008)

Attiecībā uz koksnes biomasu Latvijā darbojas brīvais tirgus, kurš konkurences apstākļos nosaka koksnes biomasas cenu. Līdz ar to koksne ir viens no nozīmīgākajiem un izmantojamajiem vietējiem atjaunojamajiem enerģijas avotiem Latvijā, kuram ir liels potenciāls. Piedevām Latvijā ir ne tikai liels neizmantoto koksnes atlieku apjoms, kurš rodas meža izstrādē un koksnes pārstrādē, bet arī visi nepieciešamie nosacījumi ātraudzīgo koku audzēšanai. („Koksnes energoresursi ... ", 2008)

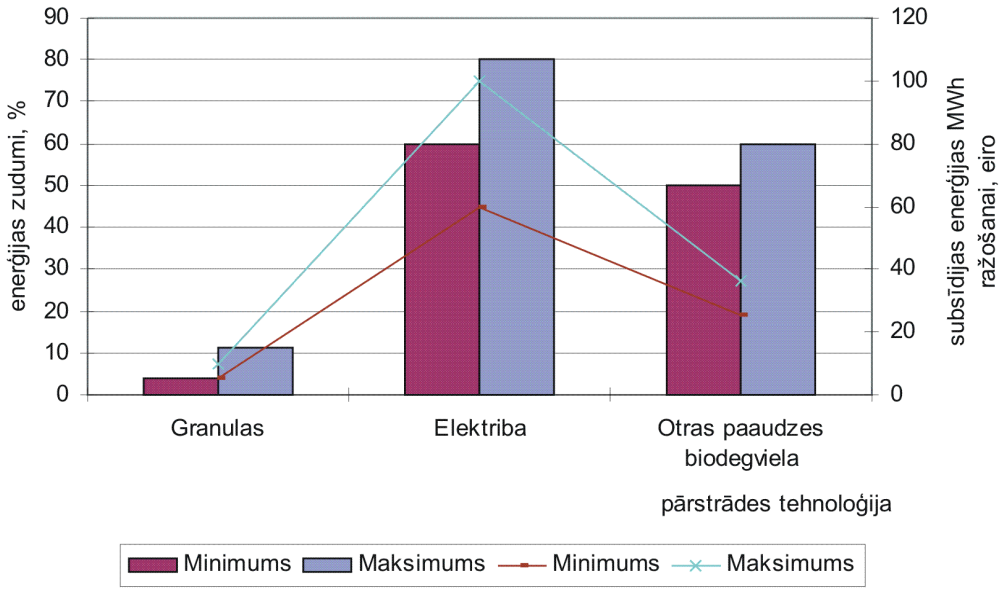
Izdevīgāko koksnes biomasas izmantošanas iespēju iespējams noteikt pēc enerģijas zudumiem, kuri rodas, koksnes biomasu pārstrādājot attiecīgi granulā, elektrībā vai biodegvielā. Plaši izskan viedoklis, ka koksnes biomasu (un biomasu vispār) vajadzētu izmantot gan biodegvielas ražošanai, gan elektrības un siltuma ražošanai. Pēc 2.attēla var secināt, ka visizdevīgāk meža biomasu ir izmantot, pārstrādājot to granulās un sadedzinot koģenerācijas iekārtās, tādejādi kā produktu radot tieši elektrību un siltumu.

Protams, var izvirzīt pretargumentu, ka visas pārstrādes tehnoloģijas atrodas izstrādes stadijās un pilnveidojas, bet tas nespēs radikāli atspēkot un



Avots: Izdevuma „Enerģētika un automatizācija" publicētie dati

1.attēls Dažādu biomasu enerģijas gala produktivitāte, GJ/ha

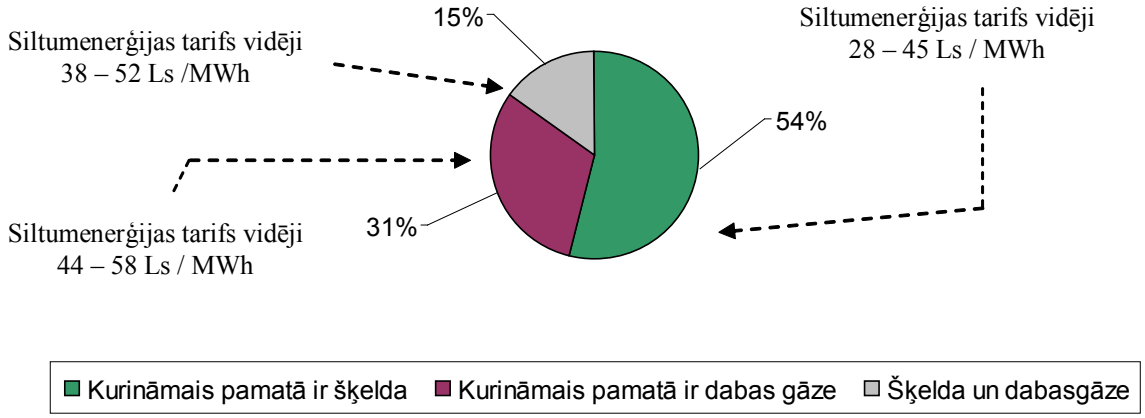


Avots: Izdevuma „Enerģētika un automatizācija" publicētie dati

2. attēls **Meža biomasas enerģijas zudumi un nepieciešamās subsīdijas MWh enerģijas ražošanai, izmantojot dažādas pārstrādes tehnoloģijas**

mainīt 2.attēlā atspoguļoto situāciju, jo tehnoloģijas pilnveidojas visās pārstrādes jomās, nevis kādā konkrētā. (Spunde I., 2008)

Latvijā koksnes granulu kā izejvielu izmantošana centralizētajās siltumapgādes sistēmās nav plaši palietota, jo, neskatoties uz to lielo lietderības koeficientu, tās ir dārgas, un ir nepieciešamas specifiskas pārstrādes iekārtas. Ekonomiski pamatota biomasa Latvijas centralizētajām siltumapgādes sistēmām ir atzīta enerģētiskā koksne jeb šķelda. Tā ir iegūstama no vietējiem resursiem, koksnes pārstrādes procesā zudumi ir vidēji tikai 30% un tā ir salīdzinoši lēta (vidēji 6 līdz 7 LVL/cieš.m^3). Līdz ar to turpmāk pētījumā tiks analizētas šķeldas



Avots: Autoru veidots

3.attēls **Siltumenerģijas tarifs siltumražošanas uzņēmumos Latvijā atkarībā no izmantojamā resursa veida, 2008.gadā (LSUA biedri)**

1.tabula

Siltumenerģijas ražošanas alternatīvu salīdzinājums

Pozīcija	Siltumenerģijas ražošana ar koksnes biomasu (šķeldu)	Siltumenerģijas ražošana ar gāzi
Iekārtas vidējās izmaksas, LVL	240 000 (maksimālā jauda 7 MW)	200 000 (maksimālā jauda 7 MW)
Nepieciešamais personāls	~ 15 darbinieki	1 operators
Izejvielu izmaksas MWh enerģijas ražošanai	1.8 – 2.0 ber m^3 šķeldas, kas ir ~ 14 LVL	118 m^3 gāzes *, kas ir ~ 33 LVL
Izejvielu mēneša izmaksas, darbojoties ar maksimālo jaudu, LVL	70 506	166 320

* 5. gāzes izmantošanas grupa, kad gāzes cena 1000m^3 = 281.10 LVL + PVN

Avots: Autoru apkopoti dati

izmantošanas specifiskās iezīmes kā racionālākais biomasas izmantošanas veids centralizētajā siltuma apgādes sistēmā. (Vīgants E., 2008)

Koksnes biomasas (šķeldas) izmantošanas izdevīgums siltumražošanas uzņēmumos

Vērtējot apkures tarifu izmaiņas 2008.gada nogalē, kad no 1.oktobra Latvijas gāze palielināja gāzes pārdošanas tarifus mājsaimniecībām vidēji par 38% un lielajiem patērētājiem atkarībā no darbības specifikas no 33% līdz 44%, siltumražošanas uzņēmumi siltumenerģijas tarifus palielināja robežās no 20% līdz 59%. Krasais tarifu pieaugums liek domāt, ka energoefektivitātes paaugstināšanas iespējas šie uzņēmumi jau ir izsmēluši. Kā racionālāko risinājumu, kas spētu samazināt siltumenerģijas tarifus, varētu minēt ražošanas tehnoloģiju maiņu, tās realizēšanai, savukārt, ir nepieciešami lieli kapitālieguldījumi. Risinājums, protams, būtu arī siltuma zudumu samazināšana pārvades trasē un ēku energoefektivitātes paaugstināšana, tomēr šie uzlabojumi būtiski siltumenerģijas tarifus samazināt nespētu. (Šnore I., 2008)

Aplūkojot Latvijas Siltumuzņēmumu asociācijā ietilpstošo uzņēmumu sadalījumu pēc resursu izmantošanas veida siltumenerģijas ieguvei (3.attēls), var secināt, ka vislētākie siltumenerģijas tarifi ir uzņēmumos, kuros kā izejvielu izmanto tieši enerģētisko koksni (šķeldu), tas nodrošina zemākas ražošanas izmaksas. Koksnes biomasai ir ekonomiski pamatota un atbilstoša cena, pārdotā elektroenerģija ļauj samazināt siltuma tarifu.

Argumentu, ka siltumenerģijas tarifus varētu samazināt ražošanas tehnoloģiju maiņa (pāreja uz enerģētisko koksni), kuras realizēšanai, savukārt, ir nepieciešami lieli kapitālieguldījumi, pierāda arī divi nozīmīgi fakti:

1) Skandinavijā, izmantojot vienu kubikmetru enerģētiskās koksnes, iegūst 1.1 – 1.2 MWh

jebkādas enerģijas, bet siltumražošanas uzņēmumos Latvijā, kuri izmanto attiecīgu tehnoloģiju, 1 MWh saražošanai nepieciešams vidēji 2.2 – 2.5 kubikmetri koksnes biomasas. Rezultāts pierāda, ka izmantotās koksnes biomasas izlietojums ir neefektīvs un ir lieli zudumi. (Orupe A., 2008)

2) Centralizētajā siltumapgādē Latvijā tikai ¼ no izmantojamajiem resursiem ir koksne (LSUA nav visi Latvijas situma ražotāji), dabasgāzes apjoms sastāda pat līdz 70% no kopējiem resursiem, līdz ar to pastāv iespēja ražošanas resursu no gāzes pārstrukturizēt uz šķeldu – vietējo kurināmo. (Zauers A., 2008)

Enerģētiskās koksnes izdevīgumu pierāda ne vien vietējo resursu pieejamība un cena, bet arī fakts, ka, ieviešot šķeldas koģenerācijas iekārtas, ir iespējams pilnībā restrukturizēt novecojušos siltumuzņēmumus, piemēram, ļaujot tos privatizēt. Ieguvums būtu gan pašvaldībai, kura no šiem uzņēmumiem varētu pirkt siltumu un tālāk to nogādāt patērētājiem, gan pašiem patērētājiem, jo siltumenerģijas tarifi samazinātos. (Akermanis A., 2008)

Salīdzinot patreizējās izmaksas, kuras siltumražošanas uzņēmumā veidojas, darbojoties ar patreiz pielietoto fosilo resursu – gāzi un koksnes biomasas - iespējām, starpība ir ļoti liela.

No administratīvo izmaksu viedokļa izdevīgāk ir darboties ar gāzi (1.tabula), jo tad viss siltumenerģijas iegūšanas process notiek automatizēti un nepieciešams tikai viens operators. Tomēr izmantojamo resursu cena MWh saražošanai diennakts laikā ir LVL 456. Parēķinot izmaksas maksimālas jaudas gadījumā mēneša ietvaros, rezultāts ir LVL 95 814. No starpības ir iespējams segt koksnes biomasas izmantošanai nepieciešamās darbaspēka izmaksas un gūt peļņu.

Turklāt patreiz veidojas situācija, kad šķeldas cena Latvijā sāk kristies. Tas skaidrojams ar produkcijas piesātinājumu Lietuvas un Igaunijas tirgos, kuras no Latvijas lielus apjomus šķeldas iepirka jau vasarā, un patreiz jauni papildus apjomi nav nepieciešami. Pastāv arī prognozes, ka šķeldas cena varētu sadārdzināties izejmateriālu trūkuma dēļ, jo daudzi kokapstrādes uzņēmumi nedarbojas ar pilnu jaudu, līdz ar to mežizstrādes apjomi samazinās. (Zauers A., 2008)

Enerģētiskās koksnes resursu novērtējums

LatBioNrg (Latvijas Biomasas asociācija) ir paudusi viedokli, ka Latvija tuvākos 10 gadus varētu iztikt ar saviem atjaunojamajiem enerģijas ražošanas resursiem un būt energoneatkarīga valsts. Izmantojot eksportētos enerģētiskās koksnes apjomus, neizmantotās koksnes biomasas ieguves iespējas un izmantojot racionālāk patreiz jau izmantotos apjomus, Latvija spētu ievērojami palielināt savu energoneatkarību. Pierādījums tam, ka šos resursus vajag izmantot, ir pavisam vienkāršs - siltumenerģijas tarifu salīdzinājums ar Somiju, kur MWh siltuma maksā LVL 35, bet Latvijā vairāk kā LVL 40, jo ražošanā tiek izmantota importētā dabasgāze. Valdošo politisko ietekmju ambīciju rezultātā Latvija ievērojami zaudē, piemēram, 2009.gadam noslēgtie koksnes biomasas līgumi paredz trīs reizes lielāku eksportu, nekā tas bija 2008.gadā, kad jau tika eksportētas apmēram 3 milj. tonnas cieš. m^3. Tajā pat laikā notiek fosilo kurināmo imports, kas Latvijas energoatkarību tikai palielina. (Briede R., 2008)

Protams, Latvija var koncentrēt savu ražošanu uz tādu atjaunojamo energoresursu kā biogāze, kas iegūta no augkopības, sadzīves un dzīvnieku izcelsmes atkritumiem. Ir aprēķini, ka tādā veidā gadā varētu izmantot ap 174 miljoniem m^3 šādu izejvielu, kuras pārstrādājot varētu iegūt 1.2. mljard. m^3 gāzes, kas ir gandrīz ekvivalents gāzes importam no Krievijas (1.7 mljard. m^3 gāzes gadā.). (Kalns J., 2008)

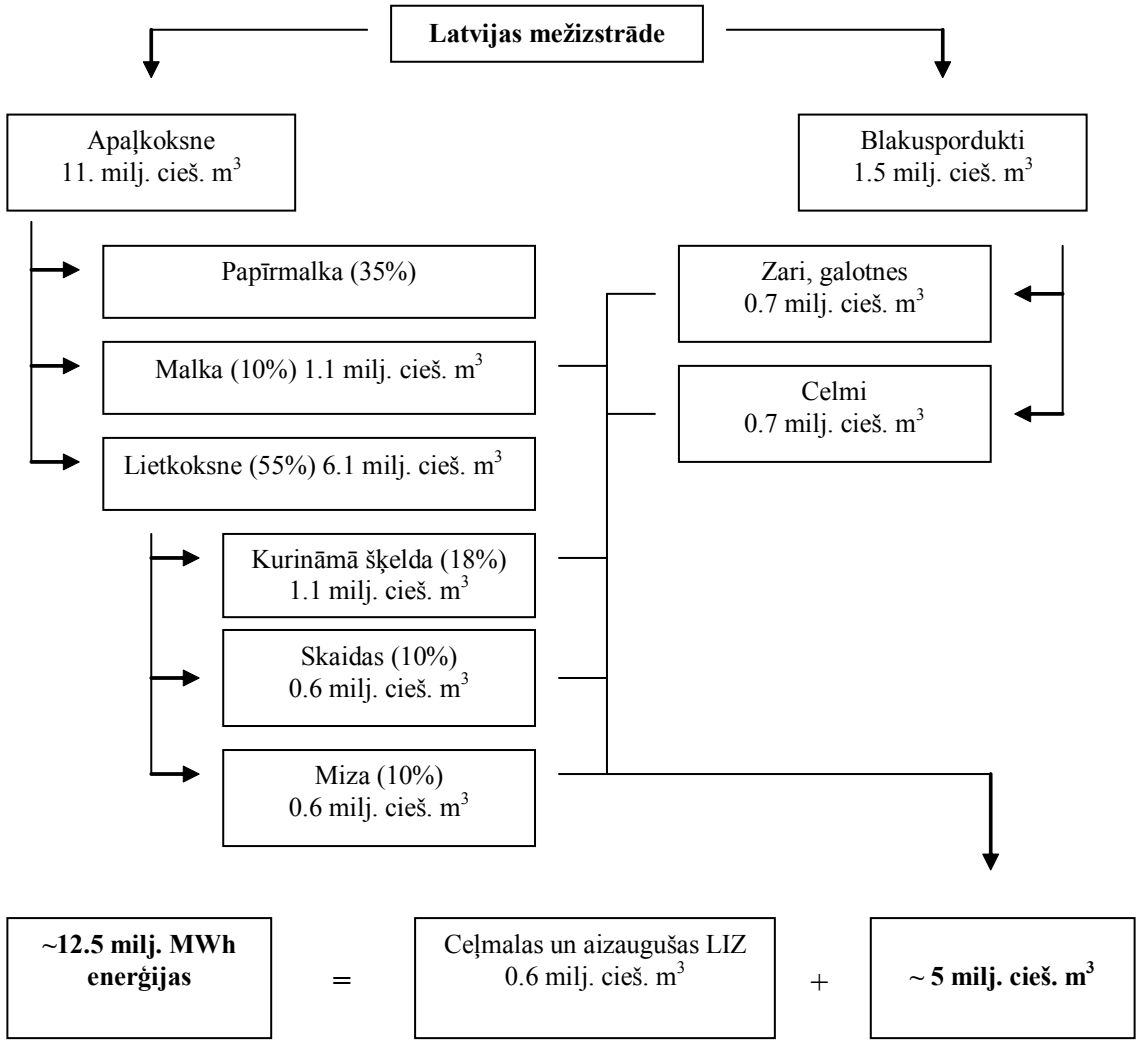
Tomēr Latvijā šāda ražošana ir tikai izpētes stadijā, un kā pierādīja biomasas enerģijas gala produktivitāte (1.attēls), tad visizdevīgāk ir koncentrēties tieši uz mežu apstrādi, kuru pārvērst enerģijā tiešajā sadedzināšanā.

Koksnes biomasa netiek ražota no lietkoksnes, bet gan no pārstrādes pārpalikumiem. Ir aprēķini, kas pierāda, ka, primāri pārstrādājot koksni produkcijā ar augstu pievienoto vērtību (mēbeles, saplākšņi), no augoša koka tam var izmantot tikai 1/3 koksnes. Piemēram, no viena izstrādāta lietkoka (apaļkoka) gala produkta ar augstu pievienoto vērtību var izmantot tikai 40% līdz 45% koksnes.

Pārrēķinot Latvijas enerģētiskākas koksnes eksportu no tonnām uz MWh, 2008.gadā ir eksportēti apmēram 8 miljoni MWh enerģijas (1 tonna enerģētiskās koksnes ir ekvivalents apmēram 2.5 MWh). Pēc būtības tie ir energoneatkarības resursi, kurus Latvija zaudē. Šiem resursiem klāt var rēķināt arī uz Skandināviju eksportēto papīrmalku, kurai krīzes ietekmē cena ir ievērojami kritusies un pieprasījums samazinājies. Kopumā potenciālās enerģētiskās koksnes eksports ir 4 – 5 miljoni tonnu cieš. m^3 jeb 11 miljoni MWh. (Briede R., 2008)

Atsaucoties uz faktu, ka Latvijas gada patēriņš ir vidēji 7 milj. MWh elektroenerģijas un tikpat siltuma, provizoriski var apgalvot, ka ar eksportēto koksnes apjomu Latvija varētu panākt energoneatkarību. Provizoriski tādēļ, ka koģenerācijā siltuma un elektroenerģijas attiecība ir 1:3 vai 1:4. Bet tik un tā, pārvēršot šos apjomus elektroenerģijā, koksnes koģenerācijas iekārtās tie būtu vairāk kā 300 000 MWh elektroenerģijas, kurus Latvija ik gadu importē. (Orupe A., 2008)

Novērtējot nākotnes perspektīvas pie pašreizējiem mežistrādes apjomiem un koksnes, no LIZ un



Avots: Izdevuma „Enerģija un pasaule" publicētie dati

4.attēls **Latvijā pieejamo enerģētiskās koksnes resursu apjomu apkopojums**

ceļmalu attīrīšanas, Latvijā gadā iespējams saražot enerģētisko koksni (4.attēls), kas spēj nodrošināt ~ 12.5 milj. MWh enerģijas. Papildus iespējams audzēt arī enerģētiskās koksnes kultūras, jo Latvijā tām ir piemērotas augsnes. 2008.gadā Latvijā tika izaudzēts pusmiljons hibrīdapšu stādu - veicot pārrēķinus un pieļaujot, ka tie visi paliktu Latvijā, būtu iespējams izveidot 450 ha plantāciju. Šādas plantācijas ha ierīkošanas kopējās izmaksas ir LVL 1000, bet tā ir investīcija trīs rotācijās, jo jāstāda būtu vienreiz, bet cirst šos kokus varētu trīs reizes. Tomēr lielāko daļu izaudzēto stādu Latvija eksportē uz Lietuvu un Zviedriju, rezultātā atkal notiek Latvijas atjaunojamo energoresursu eksports. („Koksnes energoresursi ...", 2008 un Lazdiņš A., 2008)

Lietuvā mežu ir uz pusi mazāk nekā Latvijā, bet modernās koģenerācijas iekārtas, kur izmanto koksni kā izejvielu, koģenerācijas procesā saražo 17% no valstij nepieciešamās enerģijas. Šādu iekārtu izmantošanas pretinieki Latvijā ir gāzes izmantošanas aizstāvji, minot faktu, uz lielajām Latvijas pilsētām plūdīs liela auto kustība, kas bojās autoceļus. Tajā pat laikā, nodrošinot enerģētiskās koksnes eksportu, līdz ostām koksnes biomasa tik un tā tiek nogādāta ar kravas auto, kuri naktīs kursē caur lielajām Latvijas pilsētām.

Kā pozitīvs vērtējams faktors, ka Latvijā perspektīvi attīstās celmu izstrāde. Ir aprēķināts, ka lielo celmu un sakņu krāja var veidot līdz 25% no sagatavotās apaļkoksnes krājas. Latvijā 2007.gadā šādi būtu bijis iespējams iegūt 3.3 miljonus MWh enerģijas, jo kopējā celmu biomasa sastādīja 573 tūkstošus tonnu sausnas. No viena hektāra (līdz 500 celmiem) var iegūt 150 – 200 MWh enerģijas. Celmu raušanas ražība ir no 7 – 9 m^3 stundā, kas veido izmaksas no 2.5 – 3 LVL cieš. m^3. Celmu pievešanas (izvešana no cirsmas) ražība ir 7 – 9 cieš m^3 stundā, kas veido izmaksas ~ 2.7 LVL / cieš. m^3. Pierēķinot klāt šķeldošanas izmaksas, viena cieš. m^3 koksnes biomasas (šķeldas) izmaksā LVL 6.5, bet

transportēšanas izmaksu dēļ tā sadārdzinās līdz LVL 10 cieš. m^3. Teorētiski rēķinot, enerģētiskā koksne, kas iegūta no celmu pārstrādes, var aizstāt pat līdz 90% no pašreiz siltumapgādē izmantotās koksnes.

Kopumā var teikt, ka vietējo resursu potenciāls enerģētikas jautājumu risināšanā, Latvijā ir visai ievērojams. Pienācis laiks pāriet pie tā praktiskās izmantošanas. Kā galveno šķērsli jautājuma pozitīvā virzībā var minēt izveidoto birokrātisko sistēmu Latvijā, kas ievērojami apgrūtina vietējo resursu izmantošanu enerģētikā. Par šiem jautājumiem nepieciešams veikt atsevišķu pētījumu.

Secinājumi

1. Izvirzītā hipotēze ir pierādīta, jo:
   - Latvijā vislētākie siltumenerģijas tarifi ir uzņēmumos, kuros kā izejviela tiek izmantota koksnes biomasa, salīdzinot ar fosilo resursu izmantošanu, siltumenerģijas tarifi ir pat par 7 % mazāki.
   - pie esošajiem Latvijas gada mežizstrādes apjomiem, pārvēršot koksnes pārpalikumus šķeldā un pieskaitot klāt koksni no ceļmalām un aizaugušām LIZ, ir iespējams iegūt apmēram ~12.5 milj. MWh enerģijas, kas ir gandrīz ekvivalents Latvijā gada laikā izmantojamai enerģijai.
2. Nav racionāli izmantot biomasu, tikai lai sasniegtu atjaunojamos enerģijas noteiktās izmantošanas normas, jo biomasas izmantošana elektroenerģijas un biodegvielas ražošanai rada biomasas potenciālos gala produktivitātes zudumus līdz pat 80 %.
3. Vislielākā gala produktivitāte no biomasas rodas, ja tā tiek iegūta no koksnes, turklāt vismazākie enerģijas zudumi rodas, pārstrādājot meža biomasu granulās.
4. Pašreiz izmantotās koksnes biomasas racionālāku izmantošanu iespējams nodrošināt tikai ar tehnoloģiju maiņu. To apliecina Skandināvijas piemērs - tur izmantojot m^3 koksnes biomasas, iegūst 1.1 līdz 1.2 MWh jebkādas enerģijas, bet Latvijā tam nepieciešami 2.2 – 2.5 cieš. m^3.
5. Salīdzinot šķeldas un gāzes kā siltumenerģijas iegūšanas izejvielu izmaksas pie 7 MW jaudas, izejvielu izmaksu starpība mēnesī ir LVL 95 814, kas pamato šķeldas izmantošanas ekonomisko izdevīgumu.
6. Koksnes biomasas pašreizējo ierobežoto izmantošanas iespēju rezultātā uz eksporta rēķina Latvija katru gadu zaudē ap 8 miljoni MWh enerģijas.
7. Teorētiski rēķinot, enerģētiskā koksne, ko būtu iespējams iegūt no celmu izstrādes, var aizstāt pat līdz 90 % no pašreiz siltumapgādē izmantotās koksnes.

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Effect of the Integration into the EU on the Economic Results of Different Types of Individual Farms in Poland

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Abstract

The article is an attempt at describing the effect of the integration on economic results of Polish individual farms of different types and classes of economic size measured in ESU. The object of the research has been the influence of Poland's joining the EU on plant and animal production of a medium-small farm (15 ESU), the animals fed on concentrates type, the pig fattening subtype, a medium-large farm (37 ESU), the various crops and animals with a predominance of milk and beef cattle production type, a medium-large farm (27 ESU), the pig fattening subtype, and a medium-large farm (19 ESU), and the milk production type. The results of the research have been compared with the situation of the Polish agriculture, in particular within the context of the agricultural population's income depreciation resulting from the process of the systemic transformation. The object of analysis included changes in the volume of a direct surplus on the production of cereals, sugar beet, pigs, beef, and milk in 2006 as compared to 2003. The research has proved the highest positive effect of the integration on the profitability of animal production, and in particular on individual farms' economic results on beef cattle and dairy cows breeding. A slight positive effect of the integration on the profitability of pig fattening has also been indicated. As far as plant production is concerned, a strong beneficial influence of the integration on sugar beet production's profitability has been proved. Furthermore, it has been pointed out that economic results of farms concentrating on the production of cereals have deteriorated after the integration. The article discusses also the effect the integration has had on farms' net incomes. Moreover, economic results of Polish farms before and after the integration have been compared with economic results of agricultural producers of certain types in the selected EU countries. Basing on the conclusions drawn from the performed analysis, the article includes also the prediction of social and economic changes concerning the Polish countryside and farms.

Key words: Polish agricultural income depreciation, integration of Poland into the EU, arable and livestock production profitability, Polish agricultural competitiveness, and economic transformation.

Introduction

The time, which has passed since the accession of Poland to the European Union, is sufficient to enable identification of the first effects of integration on the economic situation of the Polish family farm. In turn the assertion appearing in various discussions that Polish agriculture is the first, direct and greatest beneficiary of Polish, the EU integration invites the verification of this thesis through the analysis of the effect of the Common Agricultural Policy on the size of the gross margin, obtained by family farms from various types of agricultural production.

The attempt to define the influence of integration on the size of agricultural earnings is an important aspect of the particular analysis in the context of the income depreciation in Polish agriculture, caused by the political transformation. In the years 1989 – 1992 agricultural income fell to the level of 40.7% of the income of 1989 (Zegar. J. St., 2008). It is specific to the agrarian and raw material character of agricultural production that the market mechanism redistributes added value and depreciates agricultural value (Czyżewski A., Sapa A. 2003). It is clearly visible in the experiences of the agricultural community, which is in jeopardy of impoverishment to a significantly greater degree than other socio-economic groups. In 1996 almost 44% of family farms had a domestic income at the extreme social minimum. This percentage was virtually twice as high as that of the total number of households (24%). In the following years this indicator deteriorated to a level of 57% in 2003. A still worse picture of the income situation in the Polish agricultural community emerges from the analysis of the components forming the indicator of the population living at the boundary of subsistence minimum. In 1999 as many as 24% of family farms survived on a minimal plane of existence, while for the population

as a whole this indicator amounted to only 4.5% (Zegar. J. St., 2008). In the following years prior to the accession this indicator was subject to insignificant variation, thus confirming the drastic domestic income situation of the agricultural community in relation to the remaining professional groups. In 1997 – 1999 the average income of family farms amounted to about 54% of the sum of average farm incomes of the countries of the former EU – 15 (Józwiak W., 2007).

In connection with the above, the analyses presented constitute an attempt to answer the question whether the accession of Poland to the EU has caused a significant improvement of the economic results of Polish agricultural producers. The scale of the effects of integration has also been defined with regard to different types of arable and livestock production on Polish family farms in the analyses made. The theory is put forward that the highest increase of product profitability caused by integration took place in relation to products, for which an increasing demand was observed in the EU, in the first years after integration. Products with the highest Polish level of comparative advantage in relation to the remaining countries of the EU were dairy products, meat products, meat and offal products, live animals, and fruit and vegetable products. The degree achieved in this extent of export specialisation was virtually 2.5 times higher than in the other countries of the Community (Pawlak K., 2008). In connection with this a decidedly greater beneficial effect was expected from integration on the profitability of animal production.

As a result of the research made on the effect of integration the economic results of four family farms of various types were assessed. The analysis method consisted of a market evaluation of individual agricultural income and costs positions based on average annual reported prices. The assessment was made for 2006, with the assumption that the analysis results for this year reflect the profitability indicators of particular types of agricultural production after integration with the EU. The analysis was based on 2006, acknowledging that there was less interference, distorting the real picture of the effect of integration on the profitability of agricultural production on the analysed farms. 2004 was a transition year, whereas 2005 reflected the crop failures caused by unfavourable weather conditions. The analysis recognized direct payments and other benefits, which the farms obtained after the EU entry. Next a similar analysis was made for 2003. It was assumed that the production structure on the examined farms was the same in 2003 as it was in 2006. Particular positions in the income and costs account for the given type of agricultural production were correlated, with the aid of prices quoted for 2003. The percentage change in the size of the gross margins of particular production types analysed after integration (2006), in relation to the period prior to integration (2003), is recognized as the integration effect indicator of the profitability of agricultural production on the examined farms.

Results and discussion

The research was conducted by examining four sample family farms of various types and ESU[1] economic size class. The economic results of the following family farms were subject to analysis: medium to small farm (15 ESU) of the type animal production on cereals based concentrate feed, subtype pig rearing; medium to large farm (37 ESU) of the type mixed crop cultivation and animal rearing together; medium to large farm (27 ESU) of subtype pig rearing and medium to large farm (19 ESU) of milk production type. As a result of the analysis, gross margin indicators were obtained for particular types of agricultural production, taking place on the analysed farms and the synthetic gross margin change indicators for the entire agricultural production, produced on farms. These indicators are shown in Table 1.

Poland's accession to the EU had the most beneficial effect on the profitability of beef production. The farm undertaking beef production among others (2), recorded a gross margin of profitability of 356% in 2006 in relation to 2003. It was a very beneficial integration result involving the doubling of the base price in 2006 in comparison with 2003. Such a significant price increase was probably caused by the high exports of Polish beef to the EU countries. The increase in price of young veal calves was particularly marked, and in 2004 was greater by 45%, and the next year by close to 83%, this phenomenon was noted during conditions of declining veal calf sales. As a consequence income from the production of calves and cattle from sales increased in 2004 by 11.5% and by over 40% in 2005 and in 2006 were higher than in 2003 by 34% (Poczta W., 2008). Thus the result achieved on the examined farm differs positively to a significant degree from the average increase indicator of the whole beef production sector. The second animal production sector, which was notably beneficially affected by integration, was milk production. This is particularly visible in the case of farms that are specialised in this direction (4), which showed an integration gross margin

[1] ESU is a European size unit, expressing the economic vigour on a farm. The ESU count of a farm arises from the direct gross margin achieved (SGM), applicable to the arable and animal production structure of the farm.

increase in the order of 342% in 2006 in relation to 2003. Such a great increase in the production profitability was caused by beneficial price changes of this commodity, and also the maintenance of milk production costs after integration at an unchanged level. Simultaneously it should be stated that on these farms the benefits resulting from production scale are visible. This thesis is supported by the fact that on farms with arable and animal production combined (2) the gross margin increase noted directly from milk production was in the order of only 130% in 2006 in relation to 2003. The significant increase in the production profitability was to a significant extent caused by the increased dairy product exports to the remaining countries of the Community. In the period of 2004 - 2006 in absolute figures it may be indicated that as a result of integration, the increase in sales price values in the agricultural sector amounted to PLN 5 billion that is an increase of 20% in comparison with 2003. The two most important product commodities in Polish agriculture are milk and finished pigs, which take a 25% share of farm product sales, it should be noted that the proportion of milk in the farm sales structure increased during the integration period, while pig production remained at a similar, unchanged level (Poczta W., 2008). Additionally the milk production sector shows large growth potential because of the low production productivity. In 2003 the volume of milk production per fully employed person was virtually 84% less than on Dutch farms. In comparison with the Dutch farms, the Polish farms have significantly smaller herds and less milk production per cow (Józwiak W., 2007). The profitability of finished pig production was the sector least subject to the integration effect. Farms specialising in this type of animal production (1) noted a gross margin increase for this type of production in the order of 45%, while on the analogous farm (3) this increase only amounted to 33% in 2006 in relation to 2003. A still lower integration gross margin increase indicator was noted on the mixed farm (2), which increased by only 21%. Such a small integration increase, in comparison with the other examined animal production sectors; on finished pig production profitability is explained to a great extent by the liberalisation of the pig market in the EU. Changes in pig prices result from fluctuations in demand and supply known as the pig cycle. Furthermore, there was no significant increase in demand for Polish pigs in the EU countries; therefore the integration effect was low in comparison with the remaining instances referred to. Leaving aside the problems referred to in the pig market one should state that integration had a significant effect on livestock production profitability, and thus on the economic results of the family farms selected for analysis. This is particularly visible in the case of beef and milk production, which is indicated by the very high gross margin increase for these production types.

Integration has also changed the profitability of arable production. However, this effect has been less and definitely less beneficial than in the case of animal production. The only arable sector, for which the accession of Poland to the EU has been seen to be beneficial, it is sugar beet production. Sugar beet producers (3) have noted an integration gross margin increase of 114% in 2006 in relation to 2003. Such a large gross margin increase occurred as a result of the price increase of this commodity and the inclusion of farms, after integration, in the sugar payment system. Due to this an arable production gross margin increase of 57% is noted. It was a decidedly better result in relation to the remaining analysed farms. The sugar beet producers group benefited most in the first year after integration, as their income in 2004 from the sale of sugar beet was 59% higher than in 2003. (Poczta W., 2008). As a generalisation it should be stated that integration was unfavourable to cereals production. The reduced gross margin was partially because of the significant increase in production costs, particularly diesel oil and mineral fertilisers used in cereal cultivation, and also by the fall in cereal commodity prices after the integration. Furthermore, Polish cereals, derivative products, oils and fats are not competitive on the EU market (Józwiak W., 2007). It is very difficult however on the basis of the analysis undertaken to define the effect of integration on the profitability of maize silage production, used for feeding cattle. The analysis results for two separate farms in this extend give varying results. However one can confirm that the integration effect on the profitability of this type of plant production was small. There are also certain problems with analysing the integration effect on hay silage production profitability. On both medium - large farms (2) and (4) the loss from this type of plant production was reduced, however on farm (2) only by 11%, whereas on farm (4) by as much as 82%. Clarification of these differences is found when considering the size of area designated for the conservation of grass and legumes, and the size and structure of costs borne when making hay silage by both farms. In connection with the above it should be stated that the integration effect on plant production was small and its result depended on the type of cultivations on the farm. The year 2006 brought a decided improvement in relation to 2003 in the situation of farms specializing in sugar beet cultivation, while the economic situation of large cereal farms deteriorated. It is also confirmed by the general gross margin change indicators for arable production of the farms examined shown in the table below.

Table 1

Integration effect on the profitability of particular types of agricultural production on the analysed family farms

Medium small farm (15 ESU) of agricultural subtype finished pig rearing (1)									
Percentage gross margin change in PLN	Arable production				Livestock production				General agricultural production
	Cereals cultivation				Finished pig rearing				
	7%				45%				18%
Medium large farm (37 ESU) of agricultural subtype to varied crop cultivations and animal production combined (2)									
Percentage gross margin change in PLN	Arable production				Livestock production				General agricultural production
	Cereals cultivation	Hay silage	Maize silage	General	Milk	Beef	Finished pigs	General	
	-42%	11%	11%	-5%	130%	356%	21%	102%	54%
Medium large farm (27 ESU) of agricultural subtype finished pig rearing (3)									
Percentage gross margin change in PLN	Arable production				Livestock production				
	Cereals cultivation	Sugar beet cultivation		General	Finished pig rearing				General agricultural production
	1%	114%		57%	33%				31%
Medium large farm (19 ESU) of agricultural subtype milk and dairy cattle production (4)									
Percentage gross margin change in PLN	Arable production				Livestock production				General agricultural production
	Barley	Hay silage	Maize silage	General	Milk				
	-25%	82%	-3%	-4%	342%				109%

Source: authors' research based on the data from the analysis of family farms

Data on the integration effect on the general economic situation of the farms examined provide the gross margin change synthetic indicator of the production of the farm, shown in the last column of Table 1. These indicators show that the integration effect was definitely most beneficial for the milk producing farm (4). The entire gross margin of this farm after integration rose by as much as 109% in 2006 in comparison with 2003. It constitutes a very positive and different result from that of the remaining farms. Apart from the beneficial integration effect on the economic results of this farm, the benefits of specialisation are also visible here. Also the general gross margin of the largest farm selected for analysis (2) was increased by 54%. It is a very beneficial result, although markedly less satisfactory than in the previous instance. The improvement of the economic situation of the farm was primarily caused by the increased profitability of beef and milk production. Unfortunately milk production generated a gross margin increase of only 130% (on the previous farm it was as much as 342%). It was certainly the result of the significant production diversification of the farm. One may suppose that in a very narrow agricultural production specialisation of milk and beef the general gross margin increase would be decidedly greater. There would be then an advantage arising from the scale of production. Definitely the lowest gross margin increase was observed on farms of the finished pig rearing subtype (1) and (3). On the medium small farm (1) it was 45%, whereas on the medium large farm (3) it was 33% in 2006 in relation to 2003. In the second instance this indicator was raised by the cultivation of sugar beet. The gross margin increase on these farms should be considered as moderate, particularly in comparison with other agricultural producers. Unfortunately in 2007 and 2008 the economic situation of finished pig producers has decidedly deteriorated.

The above analysis shows that the greatest beneficiaries of integration, in the group of family farms are those farms specialised in the production of beef and milk, and to a significantly lesser extent sugar beet. The least profitable was shown to be the production of cereals on farms with an economic vigour rating to 40 ESU annually. In certain instances losses were sustained. The analysis conducted enables comparison of the economic results of the analysed farms with those obtained by the EU farms of a similar economic potential and production type. Data on annual net profit of the analysed farms in the years compared are given in Table 2.

After integration the net profit of Polish farms was still significantly lower than that of other EU farms. The average net income in conversion for 1 Polish farm in 2004 amounted to EUR 11,415, while the average net income for 1 EU farm was at a level of EUR 16,080. The average net earnings of Polish farmers in 2004 thus amounted to 71% of the average net earnings of the EU farms (Józwiak W., 2005). Analysing the above data one may state that the net earnings obtained by the analysed farms in 2003 were significantly different from the average net earnings on an EU farm in 2004. The closest comparability was found in farms with various cultivations and livestock production combined, whereas the most unfavourable net earnings in comparison with the EU earnings in 2004 were those achieved on a medium small farm specialising in the rearing of finished pigs (they constituted only 25% of the average net earnings of an EU farm in 2004). In 2006 a substantial improvement was noted in the net earnings of all the analysed farms. It was particularly significant in the case of the farm with the economic size of 37 ESU of the mixed cultivations and livestock combined type. The net earnings achieved by this farm in 2006 were doubled in relation to 2003. A similar situation is seen in the case of the dairy farm with the economic size of 19 ESU. The net earnings of the first of these farms in 2006 were 69% greater than the average net earnings achieved on an EU farm in 2004. It is an impressive result, confirming the thesis that the EU integration was most advantageous for farms specializing in beef

Table 2

Profits of the analysed farms prior to and after the EU integration [in EUR]

Item	Economic size in ESU	Agricultural type	Net profit in 2003 [in EUR]	Net profit in 2006 [in EUR]
1.	15	Finished pig rearing	4 477	6 384
2.	37	Various cultivations and livestock combined	14 316	27 171
3.	27	Finished pig rearing	8 162	12 046
4.	19	Milk production	8 259	15 800

Source: authors' research based on the data from the analysis of farms

and dairy production. It should be emphasised that in 2001 the average net earnings of one German farm of a class from 40 – 100 ESU, specialising in the rearing of various types of livestock, mainly grazing animals amounted to EUR 28,311 (Józwiak W., 2005). The result obtained in 2006 by a Polish farm of the same production type and size of 37 ESU was not significantly less than this value, which demonstrates that the farm of this size class, specialising in the production referred to, following integration made up for lost time very rapidly in relation to the EU farms and may compete successfully in the European market. Unfortunately the situation of the farm of size 19 ESU, specialising in milk production even though net earnings have doubled after integration is still not assured of a favourable situation in relation to German farms. The average net earnings for 1 German farm of a size of 40 – 100 ESU, specialising in this production amounted in 2001 to EUR 33,270. The Polish farm is a long way from that result, however it should be noted that here we are comparing the results of a medium large Polish farm with the results of large EU farms, which may be assumed to place the Polish farm as a disadvantage. Yet bearing in mind that as a result of the doubling of net earnings, this farm has practically reached the average net earnings for 1 EU farm in 2004, it should be stated that integration has raised the level of income of this type of Polish farm to near the level of an EU farm of similar type. The analysis however does not permit conclusions as to the scale of this convergence. It is essential to compare the results of Polish and EU farms of the same size class and production type to define convergence. Unfortunately the above data, similarly to the conclusions of the earlier conducted analyses confirm the still unsatisfactory situation of Polish finished pig rearers. Of course integration has increased the earnings of the analysed pig producers; however this increase is relatively low when compared with the remaining analysed farms. In 2006 the net earnings of a farm of a size of 15 ESU, specialising in this type of production only amounted to 40% of the average net earnings for 1 EU farm in 2004, whereas the net earnings of a farm of a size of 27 ESU and the same type of production was only 75% of the average net earnings in 2004 for 1 EU farm. In the second case the post-integration increase in earnings was mostly caused by the improved profitability of sugar beet production (114%) rather than the post-integration gross margin increase for finished pigs (33%). On this basis one may state that the profitability of Polish farms specialised in finished pig rearing is still extremely unsatisfactory, and that farm earnings are not conditional on the scale of production, for in the case of a farm of 15 ESU, the farmer sold approximately 100 finished pigs annually, achieving a post-integration gross margin increase in the amount of 45%, whereas in the case of the second farm annual sales amounted to about 185 finished pigs and the post-integration gross margin increase on this farm amounted to only 33%.

The results of the analysis of the earnings of the studied farms before and after integration thus confirm the conclusions arising from the data in Table 1. Again it is shown that the results of integration most benefited farms specialising in the rearing of beef cattle and dairy cows. The scale of integration benefit to economic results was conditioned by the type of production and the scale of animal rearing and the economic size of the farm in ESU; whereas the least integration improvement was in the results of finished pig producers.

Conclusions

Regarding the conclusions it is necessary to state that:

- The examined integration effect on the economic results of family farms confirms the thesis that integration was beneficial to the earnings of Polish farms. This is particularly true in the case of specialist livestock producers. In this instance integration was decidedly more beneficial to the size of the gross margin than in the case of arable producers. The results also confirm the thesis of the particularly beneficial integration effect on the economic results of producers supplying raw materials for products in particular demand within the countries of the Community. Such a situation is also noted in the instance of Polish beef and milk producers, whose production profitability has reached a very high level after integration. The changes in economic results of farms specialising in these agricultural production sectors were so marked that after integration they may successfully compete in efficiency and profitability with the farms of countries with a very productive agriculture, which is shown when comparing Polish results with those of German farms. Referring to these farms it should be stated that integration, in returning to the idea of protectionism in agriculture, has created the basis for limiting the depreciation of the earnings of the agricultural community. Thus with regard to the remaining social professional groups, Polish agriculture has been enabled to simultaneously overcome the disadvantage resulting from the political transformation.
- The results of integration on the profitability of Polish family farms achieved by the sale of finished pigs and the majority of arable production, particularly cereals has proved to

be modest, nevertheless results can be seen to be significantly better for these farms after integration than before integration.

- Poland's accession to the EU is a turning point in the history of Poland, guiding Polish agriculture towards stable growth, as a result showing improved profitability of the production of these types of agricultural products, which may assure Poland of a long-term competitive advantage in the European agricultural market. The development of Polish agriculture in the direction of such production, coupled with efficient agricultural management will lead to a modern competitive Polish agriculture.
- The main significance of integration for Polish agriculture is not only improved profitability but also it is the impetus provided for social and economic changes, liberating Polish agriculture from its state of neglect and apathy.

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Effect of Concentration and Specialisation on Value Added in Dairy Sector

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Abstract

The paper deals with the evaluation of the effect of concentration and specialisation on the value added in Latvian dairy sector on the basis of FADN data. The evaluation is carried out through analysing milk price received, the total production costs and the net value added at different level of dairy specialisation farm economic size. The analysis shows that by the increase in concentration and specialisation (the data indicate on higher level of specialisation in larger farms), the value added per AWU can be increased considerably. The significant increase in farm performance is achieved at the expense of capital. Technologies allow increasing resource utilisation efficiency both directly and through larger scale.

Key words: concentration, specialisation, milk production, the value added.

Introduction

Milk production traditionally has been one of the main agricultural sectors in Latvia with increasing importance in the recent years. In 2006, milk production accounted for almost ¼ of total agricultural output. Due to a record harvest and an unprecedented rise in prices, the production value of cereals has exceeded the value of milk, decreasing its share to 21.4% and overtaking the first position in 2007. The share of milk in final agricultural production in Latvia is higher than in the European Union (EU) on average, where it equalled to 13.8% in 2006 (Eurostat, EAA, 2008).

Though the concentration and specialisation of Latvian dairy farms is constantly increasing, the average number of dairy cows (4.6 animals in 2007) and the share of dairy specialisation farms (50.5% in 2007) is still considerably lower in Latvia than in other EU countries. In dairy specialisation farms the concentration is almost 2 times higher than on average (12.3 animals in 2007) in Latvia, but it is still comparatively small number. The data available for 2007 show that in the EU-25 the figure is ranging from 101.4 dairy cows in Denmark to 20.6 units in Finland, and the share of specialised dairy farms in the EU leading milk producing countries is about 80% (77% in the Netherlands, 83% in Denmark) (Eurostat, 2008).

At different concentration and specialization levels between Latvian and other EU dairy specialisation farms, the net value added per AWU is 3.6 times smaller in Latvia.

Having regard of resource price pressure and possible decrease in demand caused by the deterioration of economic situation both in Latvia and the EU, the increase in competitiveness and value added is important to ensure adequate compensation far the employees of the sector. The large differences in concentration and specialization levels between Latvia and other EU countries indicate on great potential in this respect.

The **aim of the paper** is to evaluate the effect of concentration and specialisation on the value added in Latvian dairy sector, based on the data of FADN (Farm Data Accountancy Network) dairy specialisation farms. In order to reach the aim, tasks were set – to analyse milk prices, production costs, and the net value added in dairy specialisation farms of different economic size.

Dairy specialization farms of different ESU[1] are used for the analysis. According to Latvian classification, farms with economic size 2-<4 ESU are very small farms, 4-<8 ESU – small farms, 8-<16 ESU - medium small farms, 16-<40 ESU – medium large farms, 40-<100 ESU – large farms, and from 100 ESU – very large farms.

In the context of this paper, the value added is defined as additional value, which is created (added to the intermediate product) in milk production stage, and which is distributed among the owners of factors of production (land, capital and labour). In terms of value, the net value added in FADN is calculated as the difference between the production value and intermediate consumption, minus depreciation and

[1] European Size Units (ESU) - the size of the farm business is measurement, where 1 ESU = 1,200 Euro of Standard Gross Margin

plus the balance of current subsidies and taxes. The net value as the difference between production value and intermediate consumption less depreciation is also used for analytical reasons.

Theoretical assumption envisages that the value added can be increased via increasing the volume of production, by increasing output prices and reducing production costs. There are also other factors that influence the formation of the value added; however, the analysis of the study is limited to these factors.

Methods of statistical analysis and logically constructive analysis were employed in the data analysis.

Results and discussion

1. Concentration, specialisation and milk purchase prices

The analysis of FADN data of dairy specialisation farms in Latvia shows that economically larger farms receive higher price for the milk produced (Table 1). The difference in received milk price between the smallest and the biggest farms was 27.8% in 2007. The average received milk price by the smallest farms was by 13.6% lower, but in the largest farms – by 12.5% higher than the average observed milk price for dairy specialisation farms. The positive relation between the average milk purchase price and farm size can be observed also in 2006, when FADN data for Latvian dairy specialisation farms were provided for the first time.

The comparison of milk price in all FADN farms also shows that the larger the farm (both in terms of economic size and dairy cow number), the higher price for produced milk it receives. Traditionally the lowest price can be observed in the smallest farms (ESU 2-<4). Furthermore, milk price received also varies among different specialisations. Milk price received by dairy specialisation farms and in mixed farming is higher than in farms of other specialisations. The available data restrict detailed evaluation of effect of specialisation; however, specialisation is closely related to the concentration. The data on dairy specialisation farms show that larger farms have higher share of milk production.

The difference in milk price between farms of different size can be explained by higher milk quality in larger farms and also by lower transportation costs per production unit.

Lower average quality in smaller farms is mainly due to insufficient technological equipment (milking, milk cooling, animal keeping conditions), lower quality and not so balanced feed. According to the Agricultural data centre milk recording results for 2007, the high protein level was observed in small farms that can be explained by higher share of Latvian Brown breed cows in these farms, which have higher protein and fat contents, but lower average productivity as compared to other main breed – Black and White Holstein breed (MoA, 2008), but milk quality is also affected by feeding and keeping conditions, for which larger farms generally have better conditions. The data show that the average somatic cell count (SCC) exceeded 400 000/ml in farms with 1-4 dairy cows. The data of farms up to 99 dairy cows indicate on decreasing average SCC by increase in the number of animals in the farm. In farms with 100 dairy cows and more, the average SCC is slightly higher compared to the previous size group. Improvement of the quality and consequently the price received for the milk is strongly related to the increase in the concentration of the farm, because improvement of technological level at farm is economically approvable by significant

Table 1

Selected indicators of dairy specialisation farms in Latvia in 2007

	farm average	2 -< 4	4 -< 8	8 -< 16	16 -< 40	40 -< 100	100 -< 250	>= 250
Number of dairy cows	12.3	3.7	7.9	16.0	33.8	81.5	220.3	448.2
Milk yield, tonnes	5.0	3.9	4.9	4.6	5.6	5.3	6.3	5.4
Milk production, tonnes	62.1	14.2	38.4	73.6	189.6	434.9	1378.7	2430.8
Milk price, LVL/t	193	170	175	189	197	201	212	217
Milk output, LVL	11 693	2 365	6 522	13 745	36 441	85 484	289 096	514 907
Share of milk production in the total output, %	56.8%	46.2%	52.9%	53.7%	62.4%	59.2%	69.7%	56.4%

Source: calculations made by the author, based on FADN data

increase in the average size of the farms (most modern technologies require at least 50 to 100 animals); the use of feeding programmes and specific feed and feed supplements also pay off in large and productivity-oriented farms with highly productive animals.

In the framework of the present milk pricing system, the delivery volume influences the difference in price received mainly indirectly through lowering costs per milk unit for larger farms, which also have better preconditions for ensuring higher milk quality. Overview of the pricing systems used in the leading European dairies shows that milk deliveries can also be used as direct factor (by quantity bonuses), which determines the milk price received.

By increase in concentration, the larger production volume allows to increase the output (which is one of the components of the value added) for a farm both at the expense of extra volume and higher price. Although the total milk production volume of Latvian dairy sector is restricted by quota, the value added still can be increased through larger delivery volumes per farm, including sales of milk currently consumed on a farm. However, the largest value added potential, especially per employee, can be attributed to the cost reduction.

2. Concentration, specialisation and milk production costs

The value added is closely linked with the competitiveness of the products on the market, because only competitive products can ensure appropriate demand, which is the basis for the production and creation of the value added. The analysis of the total production costs (not just intermediate costs and depreciation, which are used in the calculation of the value added) was used to evaluate cost competitiveness across dairy farms of different size.

The calculation results show that production costs exceeded production value in all Latvian dairy farms in 2007, but most notably in farms with the economic size less than 16 ESU. It has to be mentioned that the total costs used comprise all economic costs; including also calculated costs to unpaid labour (the average compensation level in the dairy sector was used). If the accounting costs are used, the production/costs ratio is positive in these farms, however, it does not show the real economic cost value of the products, because the labour is production factor, the use of which results in actual or alternative costs. Production subsidies improve the production/costs ration of the dairy farms by almost 24% on average, but most notably in farms with 2-<4 ESU (+33.2%), in which subsidies account for half of the production value.

Comparison of the production costs per production value among dairy farms of different size shows that the lowest cost level was in farms with the economic size 100-<250 and 40-<100 ESU (LVL 1.01); the cost level was slightly higher in the largest farm size group, however, considerably below the average level (Table 2). The total cost level per production value indicates on considerable cost advantages in large farms (farms with the economic size from 16 ESU).

The main cost positions, which have the most influence on the total cost level in dairy farms, are feed (29.1%), labour (25.0%), farming overheads (25.7%), and depreciation (11.3%). The general trend is that the share of feed is higher in large farms (starting from 16 ESU), thus it is connected with the purchase of specific animal feed and feed supplements to increase the yields. High share of labour force is characteristic for small farms, in larger farms part of labour force is replaced by capital, which is shown by the increasing share of depreciation.

Table 2

Production costs per production value in dairy specialisation farms in Latvia in 2007

Indicator	farm average	2 -< 4	4 -< 8	8 -< 16	16 -< 40	40 -< 100	100 -< 250	>= 250
Total inputs/total output	**1.16**	**1.67**	**1.23**	**1.14**	**1.03**	**1.01**	**1.01**	**1.07**
- intermediate consumption	0.73	0.81	0.75	0.75	0.72	0.69	0.68	0.69
- depreciation	0.14	0.08	0.11	0.17	0.15	0.16	0.14	0.09
- production factors	0.29	0.78	0.37	0.22	0.15	0.16	0.19	0.29
Total inputs/total output with subsidies (less taxes)	**0.88**	**1.12**	**0.92**	**0.86**	**0.80**	**0.79**	**0.82**	**0.87**

Source: calculations made by the author, based on FADN data

The analysis of the cost competitiveness in the main cost positions reveals cost advantage of large farms (16 and more ESU). Although, feed costs per LU (livestock unit) in dairy farms with economic size from 16 and more ESU are higher than the average, the data indicate on positive relation between the cost level per LU and the milk yield. Farms with the lowest level of feed costs per LU have the lowest yield, and farms with the highest level of feed costs per LU have the highest yield leading to lower costs per tonne of milk. In the farms with the economic size 250 and more ESU, feed costs per milk tonne are comparatively high that can be explained by larger share of granivore animals.

Farming overheads as fixed cost position also indicate on the advantages of scale economy. The calculated results confirm a positive relation between farm size and costs per production unit. Indicators of costs per milk tonne and LU in farms with the economic size 250 and more ESU are higher as compared to other large farms that is due to higher share of crop production.

Compensation paid for labour considerably varies among farms – the difference between the smallest amount in farms with the economic size 4-<8 ESU (farms 2-<4 ESU have no paid labour force) and the largest amount in farms with economic size 250 and more ESU (farms use only salaried labour force) is 3 times. Using the average compensation paid to evaluate contribution of unpaid labour, the differences are less explicit. In productivity terms, each spent LVL for labour can give 6.8 times higher return from production (40-<100 ESU farm group compared to 2-<4 ESU farms).

The significant increase in cost return is achieved at the expense of capital. Technologies

Table 3

Main costs per production unit in dairy specialisation farms in Latvia in 2007, Ls

Indicator	farm average	2 -< 4	4 -< 8	8 -< 16	16 -< 40	40 -< 100	100 -< 250	>= 250
Feed								
- per total production value	0.35	0.34	0.35	0.33	0.36	0.35	0.37	0.32
- per milk tonne	115.4	123.9	112.1	114.6	111.4	117.7	111.3	121.9
- per LU	340.8	253.3	333.7	301.4	370.4	385.6	436.5	399.9
Farming overheads								
- per total production value	0.26	0.34	0.28	0.29	0.24	0.22	0.17	0.21
- per milk tonne	85.2	123.5	91.0	101.4	73.0	72.4	52.6	79.8
- per LU	251.8	252.4	270.9	266.6	242.6	237.3	206.4	261.7
Labour								
- per total production value	0.26	0.77	0.36	0.19	0.11	0.11	0.16	0.26
- per milk tonne	86.7	276.0	114.6	65.7	34.8	37.2	47.3	95.8
- per LU	256.2	564.2	341.2	172.8	115.7	122.0	185.4	314.3
- per AWU[2]	2746.1	2746.1	2665.1	2467.2	2434.4	2550.1	4281.6	3845.9
- salary per paid AWU	2746.1	-	1261.7	1607.2	2053.8	2489.5	4354.4	3845.9
Depreciation								
- per total production value	0.14	0.08	0.11	0.17	0.15	0.16	0.14	0.09
- per milk tonne	44.9	28.4	35.6	59.4	47.3	53.1	41.9	35.2
- per LU	132.7	58.0	106.1	156.3	157.4	173.9	164.2	115.5
- per ha of used area	61.6	17.7	43.4	76.1	86.1	98.9	128.9	66.1
- per AWU	1422.9	282.5	828.6	2231.6	3311.9	3634.3	3790.0	1413.4

Source: calculations made by the author, based on FADN data

[2] Annual work unit (AWU) — 1 840 working hours within a year

allow increasing resource utilisation efficiency both directly and through larger scale. Modern technologies and scale economy are interconnected, because technologies require scale to be profitable, and generally considerable increase in production volume is not possible without technologies. Scale economy is also linked with specialisation, Latvian dairy specialisation farm data and available data on European countries show that in large farms the specialisation level in dairy production is higher. The highest depreciation/AWU ratio is in the farm size group 100-<250 ESU (13.4 times higher than in farms with the economic size 2-<4 ESU) and 40-<100 ESU, which allows to reach the highest productivity per AWU and also highest yields (farm size group 100-<250 ESU) as well the lowest level of farming overheads. As can be seen from Table 2, these farms have the lowest costs per production value (1.01), which is by almost 40% lower than in farms with 2-<4 ESU, and the highest cost return rate (almost 1.7 times higher than in the smallest farms).

According to the available data on economic results of dairy specialisation farms in the Netherlands, there is explicit link between the farm size and the rate of return (output per 100 euro costs). In the farm with size <70 d.s.u.[3] group (farms had 35 dairy cows on average), compared to farms with the size 70-150 d.s.u. (70.8 dairy cows), the rate of return is by 20% higher, and in farms with the size more than 150 d.s.u. (143.8 dairy cows) it increases by about more 15% (LEI, Farm Accountancy Data Network, 2008). The average rate of return in the Dutch dairy farms is comparable to the result of Latvian farms; however, it has to be stressed that the result is achieved at significantly higher input price level (mainly labour, energy and land) and comparable production price level.

Input price level has already increased significantly in Latvia after accession to the EU, though some of production resources are still considerably below the average level in the EU. Compensation for labour in Latvia is about 4.7 times lower than in the EU on average. The economic slowdown has restricted increase in prices; however, it is unlikely that in open market such a difference in compensation levels can remain for a long time. Having regard of low productivity indicators in Latvia (5.2 tonnes of milk in Latvia compared to 6.6 in the EU on average; production value EUR 13.4 thousand per AWU in Latvia compared to EUR 60.7 thousand per AWU in the EU on average in 2006) (Eurostat, FADN, 2008), increase in productivity by no means should be the main target to deal with higher resource prices and it is the basis on which the compensation for production factors can be grounded to remain competitiveness of the products.

3. Concentration, specialisation and value added

The average additional value created by production factors in dairy sector is low in Latvia. According to the calculated results (production value less intermediate consumption and depreciation), the average net value added per AWU in dairy specialisation farms was LVL 1 417.9 in Latvia in 2007 that is very small result, because it does not allow to provide the labour force for the remuneration equivalent to the average compensation for labour in the sector (LVL 2 746). Only in farms with the economic size 16-<40, 40-<100 and 100-<250 ESU the created value by the production factors could cover labour costs and also rents, but the value was still insufficient to cover interest paid.

Table 4

The net value added indicators in dairy specialization farms in Latvia in 2007, LVL

Indicator	farm average	2 -< 4	4 -< 8	8 -< 16	16 -< 40	40 -< 100	100 -< 250	>= 250
Net value added	9238.3	3104.3	5814.4	10184.4	23675.1	62739.2	172621.1	412673.2
- per LU	439.7	446.0	451.1	363.9	415.1	472.6	490.9	556.9
- per ha of area	203.9	135.9	184.6	177.2	227.2	269.0	385.6	318.9
- per AWU	4 713	2 171	3 524	5 196	8 736	9 880	11 334	6 814
Productivity (output/AWU)	10 502	3 581	7 472	13 063	21 541	22 739	27 234	15 071

Source: calculations made by the author, based on FADN data

[3] The Dutch size unit (d.s.u.) is a measure to enable the comparison of the economic size of various types of farms.

The results by the FADN net value added calculation method, which includes also the balance of current subsidies and taxes, are considerably better – the average net value added per AWU in dairy sector was LVL 4 713.4 in 2007. Except farms with the economic size 2-<4 ESU, the value added by the farms is sufficient to cover all factor costs.

By increase in concentration and specialisation (the data indicate on higher level of specialisation in larger farms), the value added can be increased considerably - the net value added per AWU in the farm group with the economic size 100-<250 ESU exceeds the average level 2.4 times, but compared to the smallest farm group (2-<4 ESU) – 5.2 times. The results show that the value added per AWU increases by the size of farm (except farms with the economic size 250 and more ESU). Based on these data, the increase in economic size by 1 ESU, increases the net value added per AWU by LVL 52. The net value added per ha of used area is also considerably higher in large farms (Table 4). The net value added per LU is affected by comparatively smaller share of livestock products in smaller farms.

If experimental calculations are made for two concentration and specialisation level cases (the current average farm of dairy specialisation and farm with the economic size 100-<250 ESU), based on the total milk production volume in Latvia and the average milk price received, intermediate cost level per production value in each case, the total gross value added of the dairy sector could be by 32% larger, if the sector was dominated by farms with the economic size 100-<250 ESU at their current development level. Given the farm with economic size productivity per AWU, the labour input would decrease by 42% more than tripling the gross value added per AWU.

As already mentioned before, the improvement in farm performance by increase in the concentration of a farm, is linked to the capital investments on the farms. Farms with the economic size 100-<250 ESU have the highest ratio of depreciation/AWU (LVL 3 790), which helps reach the highest productivity per AWU (output value per AWU – LVL 27 234) and allows paying the highest compensation for the labour force (LVL 4 354). The largest farm group, which has comparatively small net value added per AWU, has comparatively larger contribution of labour that is shown by 23.8% of labour costs in total inputs and also by comparatively lower depreciation/AWU ratio (LVL 1 413), leading to comparatively lower productivity (LVL 15 071). If subsidies are disregarded, there is imbalance between the compensation paid to the labour force and the value added per AWU in this farm group. Without subsidies, this difference would have to be compensated through market, and thus would decrease the competitiveness of the farm produce. In order to maintain the competitiveness of the farm produce and at the same time to provide growing income level for the employees of the sector, substantial increase in productivity should be achieved. As production of milk is restricted by milk quota (at least till 2004), the increase in higher income level currently is linked with considerable decrease in the number of employees. Adding more value to the farm produce and cost efficiency can restrict this number, though reorientation to other activities for the part of labour force is inevitable.

Conclusions

The analysis shows that by increase in concentration and specialisation (the data indicate on higher level of specialisation in larger farms), the value added can be increased considerably – the net value added per AWU in the farm group with the economic size 100-<250 ESU exceeds the average level 2.4 times, but compared to the smallest farm group (2-<4 ESU) – 5.2 times.

The significant increase in the farm performance is achieved at the expense of capital. Technologies allow increasing resource utilisation efficiency both directly and through larger scale. The data show on positive relation between depreciation/AWU ratio and labour productivity and yields as well as lower farming overheads, leading to the lower level of production costs per production value and better rate of cost return. The highest difference in depreciation/AWU ratio is between farms with the economic size 2-<4 ESU and 100-<250 ESU (13.4 times), which results in 40% lower costs per production value in the latter case.

According to the available data, economically larger farms also receive higher price for the milk produced. The difference in received milk price between the smallest and the biggest farms was 27.8% in 2007 that can be explained by higher milk quality in larger farms and also by lower transportation costs per production unit.

The analysis also shows that only large farms (starting from 16 ESU) by the created additional value per AWU can or are close to cover compensation for the labour force (both actually paid and calculated for family labour force). Other farms, except the smallest farms, can cover these costs only with subsidies, which are also necessary for large ones to cover all factor costs.

The economic slowdown has restricted increase in prices; however, it is unlikely that in open market such a difference in compensation levels between Latvia and other EU countries can remain for a long time. The increase in productivity by no means should be

the main target to deal with higher resource prices, and it is the basis on which compensation for production factors can be grounded to maintain competitiveness of the products, consequently ensuring creation of the value added and adequate income level for the employees of the sector.

To evaluate the strength of relations between the value added and concentration and specialisation as well as to express them in value terms, more detailed study has to be carried out, using wider statistical data.

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9. Unpublished information from the Economic Accounts for Agriculture

International Competitiveness of Estonian Cereal Production

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Abstract

The aim of the paper is to analyse the international competitiveness of Estonian cereal production during the period of 2001-2006. Cost based approach is used for characterising competitiveness of agricultural production opportunity. The dynamics of prices of non-tradable production inputs is observed. The data from the EU database of FADN are used for describing the structure of producers. The analysis is based on average indicators of agricultural sector on an example of field crops production.

The analysis of social profitability indicates that the scale of the enterprise plays an important role in competitiveness. Considering the opportunity cost price of resources the small-scale production is inefficient and in longer perspective not sustainable. The evaluation of competitive advantage showed that only large-scale enterprises have a minimal competitive advantage in production. Value of the relevant index characterising the competitiveness approximately equals to one, which means that the price of usage of domestic resources is equal to value added found on the basis of import prices. Despite the fact that in production the use of labour has decreased, the small-scale producers use considerably more labour for the same amount of end product compared to large-scale producers, and the changes in relative price of production factors affect small-scale producers more than large-scale producers, due to the use of more labour-intensive technologies are used.

Key words: competitiveness, cereal production, domestic resource cost, agriculture.

Introduction

Economic growth in Estonia has been rapid during the previous two decades. There have been significant structural changes followed by the decline of the relative share of agriculture have declined. Nevertheless agricultural production plays an important role in Estonian economy providing jobs and income. As the growth in manufacturing and especially building sector has generated excess demand for factors of production the agricultural sector faces strong competition for factors of production.

As the choice of the production technology is largely determined by the relative price of resources, the relatively low price of labour and land has so far influenced the producers to use less capital-intensive technologies in all sectors of economy. Presuming the relative stability of capital prices and increasing pressure for the rise of prices for labour and land, there is a need for changing the production technologies to more capital-intensive, and one can presume growing substitution of labour with capital. On contrary one can see radical changes in agricultural production functions which started with the support schemes for investments in agriculture.

The ability of enterprises of one country to compete with enterprises of another country is mainly influenced by the level of costs, the level of productivity, attractiveness of products, and effective sales work. Such definition of competitiveness follows the relevant interpretation of the European Commission, according to which competitiveness indicates to the ability to increase one's market share in sectors that have comparative advantage or are able to produce with lower opportunity costs (Banse, 1999).

This paper aims to analyse the competitiveness of agricultural producers in production of agricultural products important to Estonia on domestic and international market on the example of cereal production during the period of 2001-2006.

To describe the competition of agricultural production relevant to other industries one could use the opportunity cost based approach with the observation of the dynamics of prices of non-tradable production inputs. Dividing inputs into tradable and non-tradable makes it possible to analyse the influence of changes in input prices on the price of final product as well as on the competitiveness, indicating also the need to change one's production technology according to relative prices. Such approach takes into account that all resources have their price even if it seems that they are free. The production is competitive when the opportunity cost of domestic inputs is lower than the value added these inputs create.

Methodology

One possibility to evaluate the competitiveness of domestic producers on the domestic market as well as on the foreign markets, where they have to compete with domestic producers as well as with producers from other countries, is to consider the domestic resource cost. The evaluation of domestic resource cost for describing the competitiveness of agriculture has been used for evaluation of competitiveness of agricultural sector in several countries of the Central and Eastern Europe and the European Union (Kavcic and Erjavec 2001 for Slovenia, Gorton and others 2001 for Poland, Bajramovic and others for Bosnia and Herzegovina, Gorton and Davidova for countries of the Central and Eastern Europe, Banse and others 1999 for countries of the Central and Eastern Europe, Galanopoulos, K., and Mattas, K., 2006 for Greece).

One should distinguish between tradable and non-tradable resources. Tradable resources can be bought on the international market and are usually not country specific. In cereal production such tradable inputs are specific costs of cereal production (seeds, plants, fertilisers, pesticides). Non-tradable inputs usually depend on the domestic factors. When the inputs needed for producing the final product are divided into three: land, labour and capital, then loan money as part of the capital is tradable and internationally mobile, but land, workers and buildings are usually non-tradable. Non-tradable inputs are also the overhead costs of agriculture that are related to maintenance of machinery and buildings, energy consumption and contract works. The actual market price is used as the shadow price of tradable inputs, while the relevant opportunity cost is used in case of non-tradable inputs.

Calculating the price of domestic resource usage (social price) the opportunity cost price of labour is based on the prices of labour in industrial and construction sectors. Such approach is a result of increasing pressure for rising wages and growing competition for labour. Important is also the fact that not all labour is paid. Considering that the decision to work in one's own agricultural enterprise means giving up the income one could earn working somewhere else (for thorough analysis on shadow wages see Skoufias, E. 1994).

The shadow price of land is connected with the average rent price calculated on the basis of the sales prices of land suitable for agricultural production. Here two approaches were used. A phone poll was conducted among the agricultural producers and their opinion about the rent price formation was compared to the rent prices calculated on the basis of sales prices of land (according to the data of Estonian Land Board on sales prices of agricultural land). The sales price of land can be calculated through the present value of incomes earned from this land.

In case of the price of capital the main role is played by depreciation of basic assets and expenditures made on maintenance of machines, equipment and buildings, which are also country specific, resulting in opportunity cost based approach. In the same time one can assume that on the capital market there are relatively few market imperfections and the actual price of capital will be used in further analyses.

The actual price is used in case of tradable inputs.

In evaluation of the competitiveness of agricultural production the following equation is used (Gorton, M. et al. 2001, Medalla, E.,M. 1983, Ratinger, T. 2001).

$$DRC_i = \frac{\sum_{j=k+1}^{n} a_{ij} V_j}{P_i^r - \sum_{j=1}^{k} a_{ij} P_j^r} \qquad (1)$$

Where *DRC* is domestic resource cost; a_{ij} ($j=k+1$ till n) are the coefficients of resources and non-tradable inputs; V_j are the shadow prices of resources; P_i^r are the reference prices of final product; a_{ij} ($j=1$ to k) are the coefficients of tradable inputs; P_j^r are the reference prices of tradable inputs (Gorton, M. et al. 2001)

Numerator indicates the expenditures to domestic resources on the basis of shadow prices. Denominator describes the value added calculated with international reference prices. If the relevant ratio is less than 1 the domestic production is internationally competitive and the opportunity cost of domestic resources is less than the value added these resources generate.

Data and the structure of production factors

The amount of land is relatively large in Estonia. The comparison of the density of population in Estonia shows that 29 people live on one square kilometre, while in Europe the figure is 112 people on average on one square kilometre. Also the amount of agricultural land is relatively large in Estonia. According to the data of Estonian Statistical Office in 2007 the agricultural land comprised 906 833 hectares. As a result of small population (1.34 million inhabitants in 2008) there is relatively large amount of agricultural land per person in Estonia.

The importance of agricultural land as an input depends not only on its amount and physical existence but also on suitability for agricultural production.

The market of land is also influenced by the increase of competing offers for usage of the land. The land around cities moves out from agricultural usage and is used as residential land or commercial land. The possibility to change the intended purpose of land is one of the factors influencing the price of land.

The other important production factor is labour. Availability and price of the labour is influenced by the competition of other industries as well as by the decrease of labour force in Estonia. According to the Estonian Statistical Office the average wages in agriculture have been constantly increasing but are still below the average. So the increasing competition of labour results in rise of wages regardless of the changes (rise) in productivity.

Expenditures on capital are relatively more stable than expenditures related to usage of land and labour. Still the expenditures on use of capital have been influenced by wider usage of investment support. In the period of 2001-2006 the production function changed remarkably. This change can be explained by increasing mechanisation in large-scale production, where with help of investment support the amount of capital has been remarkably increased, which in turn increases the running capital expenditures. By the year 2006 the production function shows that the ratio (K/N) of capital (K) and land (N) has increased remarkably and relative use of capital is disproportionately large. Such development can be explained by the fact that when previously the labour and land were relatively cheaper compared to the capital (comparing the relative price change) then the introduction of investment support system and ability of increasing the number of producers to use support, has resulted in decline in relative price of capital. As the relative prices of production factors play an important role in choosing the production technology, then as a result of decline of the relative price of capital the production has become more capital intensive after the investment support schemes were made available. The small-scale producers have not proved to be successful in increasing the amount of capital and improving the quality, and only starting from certain production and income level sharp increase in the amount of capital and use of higher quality capital becomes possible.

The difference in division of land between producers is one of the factors influencing ability of a producer to hire workers and involve foreign capital. So the small-scale producers become less productive and the quality of capital in their usage is poorer. The key factor is the differences in used inputs for large- and small-scale producers, changing prices of production factors in different proportions, and the ability of enterprises to attract foreign capital. The unit costs of small-scale producers are more sharply influenced by the disproportionate change in prices of production inputs, because prices of production inputs, which are relatively more intensively used in small-scale production, are rising more quickly.

The structure of producers is described according to the data from the EU database FADN. According to FADN database one can say that an average producer of field crops in Estonia is relatively small in terms of the European size units (ESU). On contrary in terms of total utilised agricultural area the average producer is relatively big (Table 1).

In comparison with older EU member states the Estonian producers use relatively less capital on hectare of arable land as indicated with capital and land ratios in Table 2. As machinery and equipment is internationally tradable, the prices in different EU member states are comparable, and one can conclude lower capital intensity in production in Estonia. Lower capital intensity can result from physically smaller amounts of capital used as well as from the fact that used machinery and equipment has lower quality. One can presume that cheaper equipment with the same functionality has lower quality. The use of buildings can be explained in the same

Table 1

The comparison of field crops producers in selected EU member states, 2006

	Economic size (ESU)	Total utilised agricultural area (ha)	Total labour input (AWU)	Land rented (%)	Labour hired (%)
Denmark	50.7	62.78	0.92	26.92	28.26
Germany	112.5	136.62	2.33	73.64	44.64
Estonia	13.1	103.65	1.77	54.96	22.03
Ireland	27.7	45.93	0.73	28.78	16.44
Lithuania	10.4	64.17	1.88	60.06	23.40
Latvia	13.7	84.37	2.31	47.08	37.66
Finland	23.4	56.28	0.72	31.17	8.33

Source: FADN 2006 (the EU database)

Table 2

Fixed assets and specific costs per hectare of field crops producers in the selected EU member states, 2006 (EUR)

	Fixed assets		Specific costs			
	Buildings	Machinery	Seeds and plants	Fertilisers	Crop protection	Other crop specific costs
Denmark	9753	1160	68	75	60	42
Germany	564	680	95	124	121	27
Estonia	254	290	27	51	22	10
Ireland	415	712	82	145	105	17
Lithuania	166	489	42	69	31	4
Latvia	98	275	40	60	29	7
Finland	593	914	46	87	35	18

Source: FADN 2006 (the EU database)

Table 3

Productivity indicators of field crops producers in the selected EU member states, 2006 (EUR)

	Denmark	Germany	Estonia	Ireland	Lithuania	Latvia	Finland
Yield of wheat (100 kg/ ha)	66	69	24	91	28	31	38
Productivity of land (EUR/ha)	1852	1464	304	1159	382	396	572
Productivity of labour (EUR/AWU)	126371	85816	17787	72915	13055	14463	44725

Source: FADN 2006 (the EU database)

manner, taking into account relative equalisation of construction prices.

Expenditures on crop protection and fertilisers per hectare of arable land are also lower than in old EU member states.

Competitiveness is closely linked to productivity (for comparison of productivity in the selected EU countries see Thorne, F.S. 2005). Table 3 indicates the yield of wheat and productivity of land and labour. In Estonia the average yield of wheat is even lower than in Finland in 2006. Productivity of land is calculated by dividing the value of total production by total utilised agricultural area, and the productivity of labour indicates total production relative to total labour input. The average productivity of land and labour is very low compared to the old member states. Therefore on the assumption of comparable prices of internationally tradable inputs in different regions, the producers in Estonia have relatively low productivity.

Evaluation of alternative costs and domestic resource cost in cereal production

Further the cost of different production inputs is calculated on production of 100 kilograms of cereal based on the data of FADN database. Producers are divided into two groups by economic size. According to this approach all producers' size of whose agricultural household is smaller than 40 European size units (ESU) are described as small-scale producers. Large-scale producers are those whose economic size is larger than 40 ESU. Table 4 describes the usage of land in agricultural production according to the economic size of a producer. From land used for cereal production on observation period on average 17.16% was used by small-scale producers and 82.84% by large-scale producers. This proportion has been stable during the years. Large-scale producers use an average 64.97% and small-scale producers 58.92% of land for cereal production.

Table 4

Use of land and labour in agricultural production according to the size of a producer in Estonia, 2001-2006

	Rented agricultural land (ha)		All agricultural land in use (ha)		All land used for cereal production (ha)		Labour costs in hours		Costs of paid labour in hours (EUR)	
ESU	<40	>40	<40	>40	<40	>40	<40	>40	<40	>40
Average	78.32	482.24	125.28	604.69	73.73	392.75	4400.9	13399	1.23	1.62

Source: FADN 2001-2006 (Estonian database)

Comparing the used labour one can see that large-scale producers use 75.28% and small-scale producers 24.72% of all labour.

Leaving the capital out at first and observing only the ratio of labour and land one can see that the large-scale producers have lower ratio (L/N) of labour (L) and land (N) than small-scale producers. The number is 22.16 for large-scale producers and 35.13 for small-scale producers. These results characterise the average working hours per hectare. So the small-scale producers use on average 1.58 (35.13/22.16) times more labour per one hectare. But the ratio of the average labour cost is only 1.32 (1.62/1.23) (average cost of labour in hour for large-scale producers divided by the average cost of labour in hour for small-scale producers). Assuming that the price of capital is constant, the large-scale producers have an advantage in production, because the relevant labour cost per hectare is lower than the use of labour per hectare. The small-scale producers would have an advantage if the average ratio of labour cost per hectare would be higher than 1.58. Only in this case the lower wage level of small-scale producers would compensate higher labour intensity for one hectare.

Now we will look into shaping of the value added in terms of private and social expenditures. Private profitability means the profitability calculated on the basis of economic indicators declared in FADN database. The domestic price in the analysis of private profitability is the domestic purchase price of wheat. The domestic price of tradable inputs sums up the unit price of seeds, plants, fertilisers and pesticides and other unit costs of cereal production for 100 kilograms of cereals. In the observed period the average income of large-scale producers was higher than the average income of small-scale producers. Nevertheless, assuming that both large-scale and small-scale producers get equal price for their product one can say that the value added has not been remarkably different considering the size of producers.

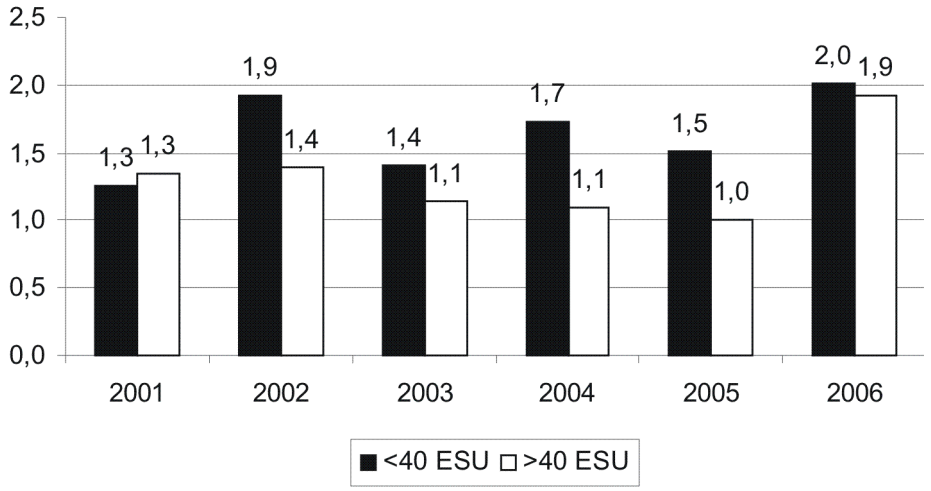
One additional reason for relatively high value added of small-scale producers is relatively lower use of tradable inputs compared to large-scale producers. In the same time the profitability of small-scale producers is largely influenced by the high ratio of agricultural overhead costs. Small-scale producers also use relatively more unpaid labour and relatively less rented land.

When analysing the social profitability the import price of wheat was used as the reference price. Considering the economic size of an enterprise one can say that based on alternative costs expenditures on producing 100 kilograms of cereal are much higher in small-scale production than in large-scale production.

As a result of evaluation of competitive advantage (Figure 1) one can see that only the large-scale enterprises have the minimal competitive advantage in production. The value of relevant index describing the competitiveness (DRC) is approximately equal to one in years 2003-2005 thus referring to the fact that the domestic resource cost and the value added calculated on bases of import prices are equal. The bigger is the value of the relevant index the higher is the domestic resource cost compared to value added calculated on the basis of import prices and the lower is the competitiveness of a producer. The rise of the DRC ratio in 2006 can be explained by very low productivity compared to the previous years.

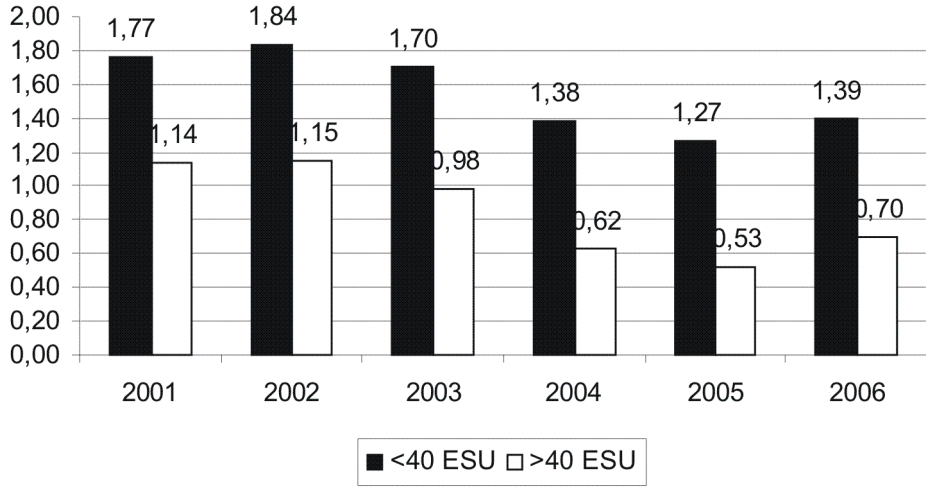
Regardless the fact that the use of labour in agricultural production has decreased, the small-scale producers still use remarkably larger amount of labour for producing the same amount of final product compared to large-scale producers (Figure 2), and the rise of the price of labour influences small-scale producers more than large-scale producers due to the use of more labour intensive technologies.

Assuming the stability of capital price, and more and more increasing pressure for the rise in prices of labour and land, the need to use more capital intensive technologies becomes evident, as a production input the capital is becoming relatively cheaper compared to labour and land. One can conclude that the labour is being increasingly replaced by capital. In the case of small-scale producers the lack of ability to meet



Source: FADN 2001-2006 (Estonian database)

Figure 1. **Domestic resource cost (DRC) index value in Estonia, 2001-2006**



Source: FADN 2001-2006 (Estonian database)

Figure 2. **Labour requirement in hours for producing 100 kg of cereal in Estonia, 2001-2006**

the requirements for investment support may force small-scale producers leave production or consider new alternatives in the use of land.

Conclusions

As the choice of production technology is greatly determined by the relative price of resources, then the previous relatively lower price of labour and land has made producers to choose less capital intensive technologies. But as a result of investment supports the capital has become relatively cheaper and following the dynamics on the prices of inputs one can conclude the increasing need for further substitution of labour with capital.

The evaluation of competitive advantage showed that only large-scale enterprises have a minimal competitive advantage in production. The value of the relevant index characterising the competitiveness approximately equals to one, which means that the price of usage of domestic resources is equal to value added found on the basis of import prices.

Due to the difficulties in attracting capital, small-scale producers find themselves in labour intensive production. Despite the fact that in production the use of labour has decreased, the small-scale producers use considerably more labour for the same amount of end product compared to large-scale producers, so the price of labour affects the small-scale producers more than large-scale producers due to the us of more labour-intensive technologies.

Acknowledgements

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Choice of Tractor Aggregates for a Definite Amount of Work

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Abstract
The article considers an issue for choosing tractor aggregates necessary to perform a definite amount of work by means of an economic- mathematical simulation method. The analysis of the data obtained in the process of simulation allowed establishing the conclusion that there is an economically efficient working width and, consequently, an optimal number of aggregates for a definite amount and conditions of work.
This method allows a motivated choice of the necessary number of aggregates to perform a definite amount work taking into account the economic expediency.
The computer software MS Excel Solver was used to calculate the mathematical model solving it as an optimisation task of non-linear programming. As an example, the choice of a tractor aggregate was discussed for the cultivation of soil for sowing cereals from the range of machines TopDown (the firm VÄDERSTAD).
Key words: amount of work, specific costs, working width, tractor aggregate, economic-mathematical simulation.

Introduction
In many respects the production of competitive agricultural products depends on the introduction of contemporary technologies, a motivated amount of the machines used and their energy intensity.

The application of economic-mathematical methods in the technical provision of the production processes allows a motivated choice of technical means and their re-equipment, ensuring higher technical and economic indices, and standards of agricultural production. This opens new non-traditional ways for the solution of production tasks using information technologies.

Materials and methods
The aim of this paper is to develop a method for the choice of a necessary amount of tractor aggregates in order to carry out a certain amount of work. The method will provide information to the producer of agricultural products so that he could make a more motivated choice on the number of tractor aggregates for a certain amount of work considering the farm requirements and conditions during the modification and adaptation of the new cultivation technologies of agricultural crops.

Economic-mathematical models and a method of parametric optimisation of functional dependences reflecting the character of the investigated process were applied to solve this task, there [1, 2, 3, 4]. The functional dependences were found on a theoretical basis of completing tractor-machine aggregates.

Results and discussion
The proposed method for the choice of a necessary number of tractor aggregates performing a definite amount of work is discussed as an example in which a certain amount of work may be carried out by means of two or one aggregate in fixed agrotechnical terms. In the first case there are high expenses for salaries, fuel and depreciation. In the second case, due to the use of an aggregate with a great working width there are higher expenses for depreciation related to its high price.

The amount of work is 800 hectares. It is necessary to prepare soil for sowing in fixed agrotechnical terms – 10 working days – using the TopDown soil tillage aggregate which ensures the necessary structure of soil. With the help of the developed economic-mathematical models for the choice of tractor aggregates [1, 2], we find out a motivated working width of the aggregate for the fixed amount of work. The mathematical model for the solution of the task is presented in a general way:

$$Z = F(T, P)$$

where Z- the specific effective costs. They include the depreciation costs of the tractor and agricultural machines, expenses for salaries and fuel.

Deductions for the repairs and maintenance are not included into the specific effective costs because they are not connected with the working width of the

aggregate. They are calculated in proportion with the work to be carried out.

T **-** the vector of technical parameters:

(The capacity of the source of energy, the working width of the agricultural machine, the technological speed of the aggregate, the specific resistance of the machine, the utilisation coefficient of the engine power).

P – the vector of cost parameters:

(The specific price of the agricultural machine, the price of fuel, salary per hour of work, percentage of depreciation deductions).

Calculation of the mathematical model was conducted by means of the software MS Excel Solver, solving it as an optimisation task of non-linear programming.

If the particular amount of work (800 ha) is carried out by two aggregates, each of them has to cover 400 ha. Using the mathematical model presented above, we determine an economically efficient working width for each aggregate. The basic input data on the machines TopDown – their prices, the technological speed of work and the required capacity were obtained from the distributor company Väderstad.

As a result of the calculation of the mathematical model, solving it as an optimisation task of non-linear programming, we obtain the optimal value (3.08 m) of the working width of the agricultural machine TopDown TD 300, the tractor McCormick XTX 200. In this case the optimal effective costs were 19.8 LVL/ha excluding the expenses on repairs and technical maintenance.

Figure 1 shows variations in the effective costs of the selected model of the aggregate depending on the working width and the amount of work as well as the fixed agrotechnical terms.

The outlined field in the graph of Figure 1 shows variations in the effective costs within the range from 10 to 20 LVL/ha depending on the working width, the amount of work, and the fixed agrotechnical term. In this field of values of the effective costs there is the optimal value Z = 19.8 LVL/ha with the coordinates (B=3.08 m, Ω=400 ha) at the fixed 10-day agrotechnical term. It is also obvious from the graph that the effective costs have different values when the values of the working width and the amount of work are different. If the working width and the amount of work are increased, the effective costs decrease. The limitations imposed on the amount of work (in this case 400 ha) and the agrotechnical terms (10 days) narrow down the number of additional solutions which ensure a minimum value of the specific effective costs.

When the amount of work was 800 ha at a fixed 10-day agrotechnical term, the optimal value of the working width of the agricultural machine was 6 metres. This amount of work can be performed using, for example, the tractor aggregate Case Quadtrac 9370+ TD 600.

Figure 2 shows variations in the specific effective costs when the amount of the performed work is limited to 800 ha and the fixed agrotechnical term is 10 days. In this case the optimal effective costs were 18.4 LVL/ha excluding the expenses on repairs and technical maintenance.

The outlined field in the graph of Figure 2 shows variations in the effective costs within the range from 9 to 19 LVL/ha depending on the working width, the amount of work, and the fixed agrotechnical term. In this field of values of the effective costs there are the optimal costs Z = 18.4 LVL/ha with the

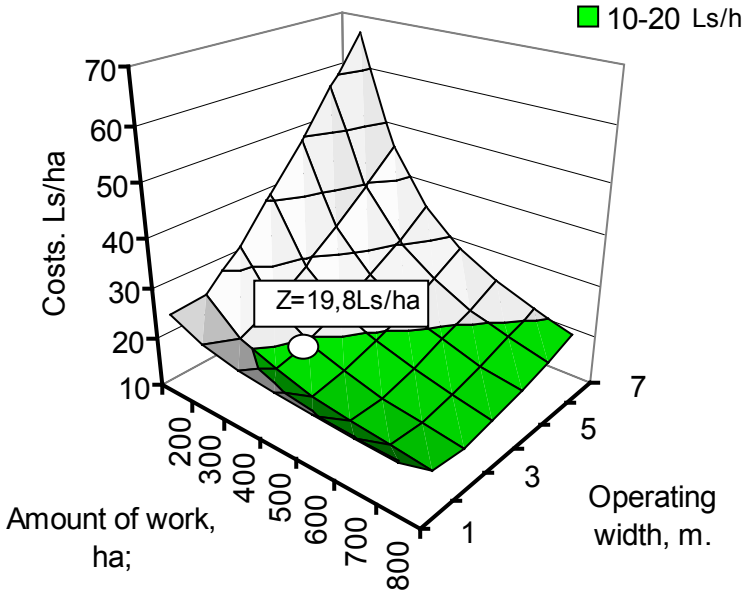

Fig. 1. **Variations in the effective costs depending on the working width and the amount of work**

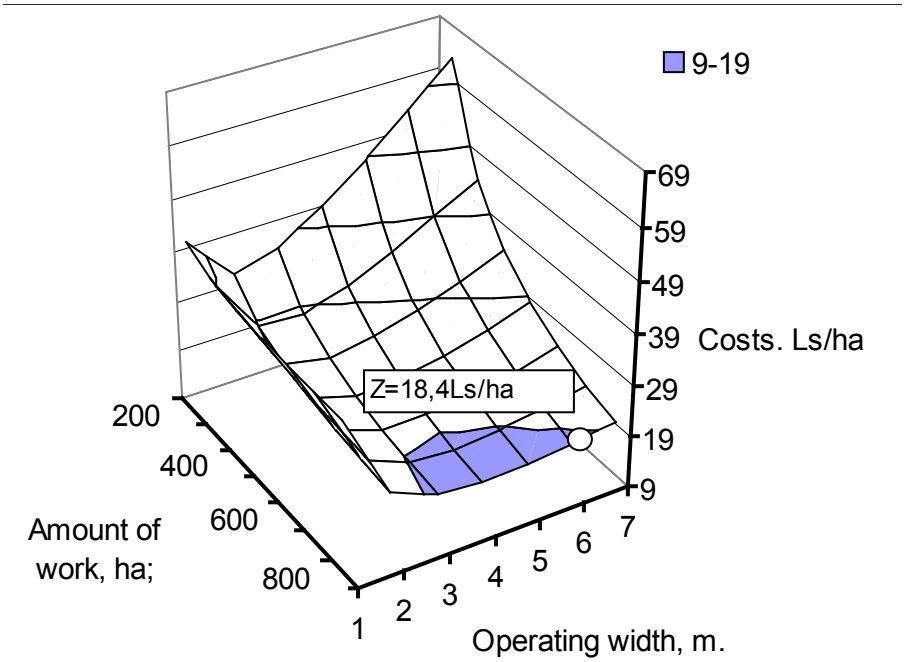

Fig. 2. **Variations in the effective costs depending on the working width and the amount of work** (The limitation imposed on the amount of the performed work was 800 ha, the agrotechnical term -10 days).

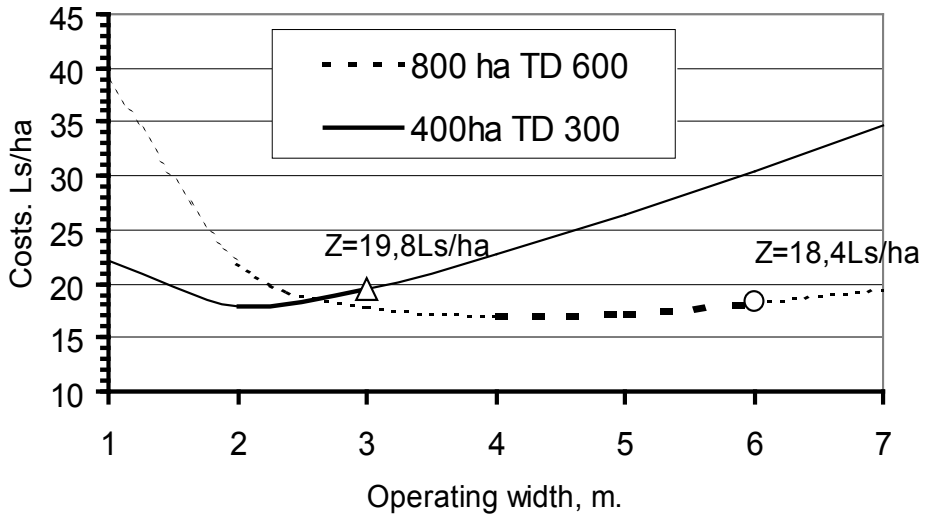

Fig. 3. **Variations in the specific effective costs depending on the working width of the aggregate taking into consideration the limitations imposed on the agrotechnical term (10 days)**

coordinates (B=6.1 m, Ω=800 ha) at the fixed 10-day agrotechnical term.

From the two considered variants the specific effective costs are by 7% less if this work is performed by one aggregate. In both variants, if the economically efficient working width of the aggregate is chosen, the imposed limitations lead to the increase in the working width of tractor aggregate, and this, in its turn, creates a prerequisite for the application of energy-intensive technical means.

Figure 3 shows variations in the specific effective costs and the optimal value of the working width of the agricultural machine performing a fixed amount of work in limited agrotechnical terms.

It is obvious from the graph that the minimal value of the specific effective costs (the field of the curves drawn with thick lines) does not coincide with the

optimal value determined as a result of the calculation of the mathematical model. This is because of the fixed definite amount of the performed work and the imposed limitations on the agrotechnical terms. Therefore, when a tractor aggregate is chosen, the fixed limitations (the amount of work, agrotechnical terms) should correspond to the allowed value which satisfies the considered process (the implementation efficiency of the technology).

Consequently, in the example discussed, if the task of the work is to prepare 800 ha of soil for sowing by means of two aggregates (2 - McCormick XTX 200+TopDown TD 300) in a 10-day agrotechnical term, the costs will make LVL 15840, but using one aggregate (Case Quadtrac 9370+ TD 600) – LVL 14720. The final economy will be LVL 1120.

The data indicate that there is an economically efficient working width of the aggregate for a particular amount of the performed work. It is more efficient to carry out great amounts of work using energy-intensive aggregates with a great working width than by means of several aggregates having a small working width. However, in this case one should take into account such a factor as reliability. For instance, if the work is performed by two aggregates, as in the example given above, and in case one aggregate fails to operate, 40 ha will not be covered during a working day. If the same work is done by one aggregate and in case it fails to operate, 80 ha will not be covered during one working day.

It is also necessary to consider the possibility of annual loading, particularly, if the price of the aggregate is high, because the renovations costs increase. Yet the performance of work by means of a great number of aggregates puts forward the problem of the personnel.

The discussed method of non-linear programming to choose tractor aggregates for a definite amount of the performed work (for example, 800 ha) may be applied also to obtain initial information for the simulation of the optimal technical provision of all the field operations on the farm where the well-known method of linear programming is applied. In this case only the non-linear correlation of the parameters will be considered which characterises the operation of the aggregate.

Conclusions

The presented method allows motivated choice of the necessary number of aggregates to perform a definite amount work taking into account the economic expediency.

It is economically more efficient to carry out great amounts of work by means of energy-intensive aggregates having a large working width than by a great number of aggregates having a lesser working width. In this case, however, one should take into consideration such factors as the reliability of the technical means un the issue of the personnel.

The results of the analysis indicate that there is an economically efficient working width of the aggregate for a definite amount of work and particular conditions.

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Kopsavilkums

Rakstā aplūkots jautājums, kā, izmantojot ekonomiskās un matemātiskās modelēšanas metodi, izvēlēties nepieciešamo traktora agregātu skaitu, lai veiktu noteiktu darba apjomu. Pēc modelēšanas procesā iegūto datu analīzes rezultātiem noskaidrots, ka noteiktam darba apjomam un apstākļiem atbilst ekonomiski efektīvs agregāta darba platums un tādējādi arī optimāls agregātu skaits. Lielus darba apjomus ir efektīvāk veikt ar lieljaudas agregātiem, kuriem ir liels darba platums, nekā ar agregātiem, kuru darba platums ir neliels. Tomēr ir jāņem vērā arī tāds faktors kā drošums. Piemēram, veicot darbu ar diviem agregātiem, kā šajā rakstā aplūkotajā piemērā, ja pārstāj darboties viens agregāts, vienas darba dienas laikā netiks apstrādāti 40 ha. Kad to pašu darbu veic viens agregāts, tad tā kļūmes gadījumā vienas darba dienas laikā neapstrādāti paliks 80 ha. Tāpat ir jāņem vērā gada slodzes iespējamība, it sevišķi, ja agregātam ir augsta cena, jo pieaug renovācijas izdevumi. Taču darbu veikšana ar lielāku agregātu skaitu izvirza kadru problēmu.

Šī metode ļauj pamatoti izvēlēties nepieciešamo agregātu skaitu, lai veiktu noteiktu darba apjomu, ņemot vērā ekonomisko mērķtiecīgumu, kā arī paver jaunus netradicionālus ražošanas uzdevumu risināšanas ceļus, izmantojot informācijas tehnoloģijas.

Matemātiskā modeļa aprēķinam ir izmantota datorprogramma MS Excel Solver, to risinot kā nelineārās programmēšanas optimizācijas uzdevumu. Kā piemērs tiek aplūkota traktora agregāta izvēle augsnes sagatavošanai graudaugu sēšanai no mašīnu nomenklatūras TopDown (firma VÄDERSTAD).

Piena pašizmaksas salīdzinošā analīze Latvijas piena lopkopības saimniecībās
Comparative Analysis of Milk Production Costs in Latvian Dairy Farms

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Abstract
The objective of this article is to calculate the cost of milk produced in Latvian dairy farms, to make the comparative analysis of milk production costs and production cost structure for different economic size farm holdings for the period between 2004 and 2007. The research is based upon FADN collected database, which characterises the activities in dairy sector. The research results display that the production cost of one litre of milk throughout all these years and almost in all farm holding groups has exceeded the sales price. However the support payments n their turn available to farm holdings have covered the risen negative difference. The proportion of milk in the livestock output and total output was bigger in large farms. The analysis of milk production costs structure shows that during the last years the biggest proportion in the costs is made by fodder and depreciation.
Atslēgas vārdi: pašizmaksa, piena pašizmaksas kalkulācija, piena lopkopība
Key words: prime cost, calculation of milk prime costs, dairy.

Ievads
Introduction

Pētījuma mērķis ir veikt Latvijas piena lopkopības saimniecībās saražotā piena pašizmaksas salīdzinošo analīzi dažādās pēc ekonomiskā lieluma saimniecībās 2004. - 2007. gadā. Mērķa sasniegšanai ir formulēti šādi uzdevumi:

1) izpētīt ražošanas izmaksu struktūru piena lopkopības saimniecībās;
2) veikt piena pašizmaksas kalkulāciju dažādās pēc ekonomiskā lieluma saimniecību grupās;
3) veikt piena pašizmaksas un pārdošanas cenas salīdzinošo analīzi, izvērtējot ražošanas atbalsta nozīmi saimniecību ienākumu veidošanā.

Pētījuma hipotēze ir: piena pašizmaksas kalkulācija veicina lauksaimnieciskās ražošanas procesa efektīvu vadību un veido pārdomātās atbalsta piešķiršanas politikas pamatu. Pētījums ir balstīts uz SUDAT bāzē apkopotiem datiem, kas raksturo piena lopkopības sektora saimniecību darbību. Pētījumā ir izmantota monogrāfiskā, salīdzinošās un koeficientu analīzes, grupēšanas, datu statistiskās apstrādes, dedukcijas un indukcijas metode. Pētījuma bāze ir Latvijas piena lopkopības saimniecību (41. specializācija saskaņā ar FADN tipoloģiju) atbilstoši SUDAT atlases kritērijiem noteiktā izlase (2004. g. – 149, 2005. g. – 203, 2006. g. – 213 un 2007. g. – 141 saimniecība), kura tādējādi ir uzskatāma par reprezentablu.

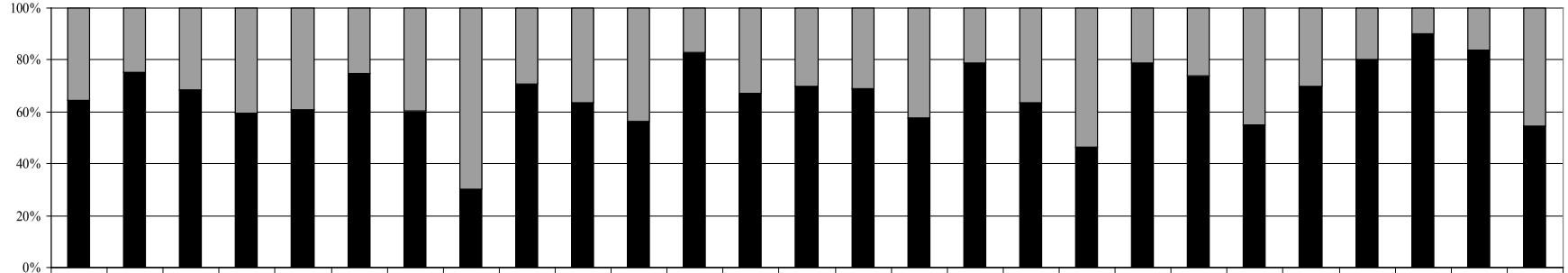
Tā kā daudzas piena lopkopības saimniecības nodarbojas ar vairāku lauksaimniecības produkcijas veidu ražošanu (t. sk. cūku un liellopu produkcijas u. c.), aprēķinot piena pašizmaksu, īpaši svarīga ir korekta tiešo un pieskaitāmo izmaksu sadale un attiecināšana. Pētījuma ietvaros bija veikta piena pilnās pašizmaksas kalkulācija (*full costing*), izmantojot procesa izmaksu (*process cost*) metodi. (Kohler's Dictionary, 1983) Kā norāda daži autori (Kučera M. et. al., 2003), tā ir lauku saimniecībās visplašāk izplatīta. Tieši šo pašizmaksas veidu bieži izmanto uzņēmuma darbības ilgtermiņa plānošanā jeb programmēšanā (*programming*), jo tā dod iespēju aprēķināt vēlamo produkcijas realizācijas cenu. (Anthony R. N. et. al., 1995)

Lai noteiktu pieskaitāmo izmaksu[1] un saņemtā ražošanas atbalsta attiecināšanas likmi (*cost rate*, *recovery rate*, *absorption rate*), pētījumā kā bāzi izmantoja saražotā piena vērtības īpatsvaru saimniecības saražotās produkcijas kopējā vērtībā.

[1] Šajā pētījumā kā pieskaitāmās izmaksas bija noteiktas izmaksas, kas radušās no ēku un tehnikas uzturēšanas, degvielas un smērvielu iegādes, maksājumiem par elektrību un apkuri, pakalpojumiem, tehnikas nomu u. c., kā arī nolietojuma (ēku, iekārtu un mašīnu, pārējo pamatlīdzekļu) atskaitījumi, ārējās izmaksas (algotais darbaspēks, procentu maksājumi un nomas maksa), nealgotā darbaspēka izmaksas un izmaksu korekcija ražas gadam.

Latvijas piena lopkopības saimniecībās ražotā piena izmaksu struktūra pa ekonomiskā lieluma grupām (2004. un 2007. g.)
Structure of milk production costs in Latvian dairy farms (grouped by by ESU), 2004 and 2007

Izmaksu postenis / Item of costs	Vidēji/Average		2 - < 4		4 - < 8		8 - < 16		16 - < 40		40 - < 100		100 - < 250	
	2004	2007	2004	2007	2004	2007	2004	2007	2004	2007	2004	2007	2004	2007
Lopbarība / Feed	46.7	42.1	46.7	38.8	44.7	44.6	52.7	42.9	43.8	47.0	43.8	43.5	45.8	41.8
t. sk. pirktā / purchased	*13.0*	*15.0*	*11.8*	*15.2*	*11.2*	*12.6*	*13.0*	*12.7*	*13.7*	*19.0*	*16.0*	*15.8*	*19.8*	*27.7*
pašražotā / home-grown	*33.7*	*27.1*	*34.9*	*23.6*	*33.5*	*32.0*	*39.7*	*30.2*	*30.1*	*28.0*	*27.8*	*27.7*	*26.0*	*14.1*
Veterinārās izmaksas / Veterinary fees	3.1	2.7	2.5	2.5	2.8	3.2	3.1	2.5	4.6	2.6	3.6	2.9	1.9	3.3
Ēku un tehnikas uzturēšana, elektrība un apkure / Maintenance of equipment, electricity, heating fuels	7.2	7.9	4.5	3.2	7.7	9.3	7.0	8.8	9.8	8.6	7.2	7.0	7.1	6.2
Pakalpojumi, tehnikas noma / Service, rent of equipment	1.7	1.9	1.9	3.5	1.8	3.4	1.5	1.1	1.6	1.1	1.0	2.0	2.8	0.9
Degviela, smērvielas / Fuel, lubricants	7.3	7.0	4.5	2.4	6.7	7.5	7.6	7.4	9.7	7.2	10.3	7.7	9.0	8.1
Nolietojums / Depreciation	6.9	10.8	2.8	5.1	7.9	8.5	6.0	10.9	11.1	14.5	11.1	13.7	5.5	13.5
Nomas maksa, procentu maksājumi / Rent, interests	1.5	2.2	0.2	1.0	1.5	0.8	2.2	2.7	2.4	3.0	2.6	4.1	1.4	2.5
Darbaspēka izmaksas / Wages paid	19.9	18.0	34.3	37.8	22.8	14.4	13.1	14.5	8.5	9.2	13.3	13.4	22.8	15.3
t. sk. algotā / paid	*3.9*	*4.3*	*0.3*	*0.0*	*0.3*	*1.5*	*2.6*	*1.5*	*4.0*	*3.8*	*12.0*	*11.2*	*22.8*	*14.4*
nealgotā / unpaid	*16.0*	*13.7*	*34.0*	*37.8*	*22.5*	*12.9*	*10.5*	*13.0*	*4.5*	*5.4*	*1.3*	*2.2*	*0.0*	*0.9*
Pārējās specifiskās un pieskaitāmās izmaksas / Other overheads and specific costs	5.5	7.4	2.7	5.5	4.1	8.3	6.8	9.2	8.6	6.9	7.1	5.6	3.8	8.4



	Vidēji / Average				2 -< 4 ESU			4 -< 8 ESU				8 -< 16 ESU				16 -<40 ESU				40 -< 100 ESU				100 -< 250 ESU			
	2004	2005	2006	2007	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007
Nolietojums / Depreciation	1194	2153	2818	2758	652	701	401	736	1240	1276	1220	1822	3847	4369	2887	6855	10323	11314	8763	8883	25619	30091	17727	18867	28993	54414	55279
Neto ieguld. / Net investm.	2152	6463	6124	4080	1020	2097	608	317	3018	2219	1569	8938	7858	10180	6452	9419	38834	19723	7578	33205	73040	36831	40926	76045	259602	285739	66474

1. attēls. Nolietojums un neto ieguldījumi Latvijas piena lopkopības saimniecībās pa ekonomiskā lieluma grupām (2004. – 2007. g.)[2] Depreciation and net investments in Latvian dairy farms (grouped by by ESU), 2004 – 2007

[2] Attēlā nav atspoguļoti 2004. gada dati par saimniecību grupu „2-<4 ESU", kad nolietojums (LVL 280) pārsniedza bruto ieguldījumus, kā rezultātā neto ieguldījumi bija negatīvi (LVL – 143).

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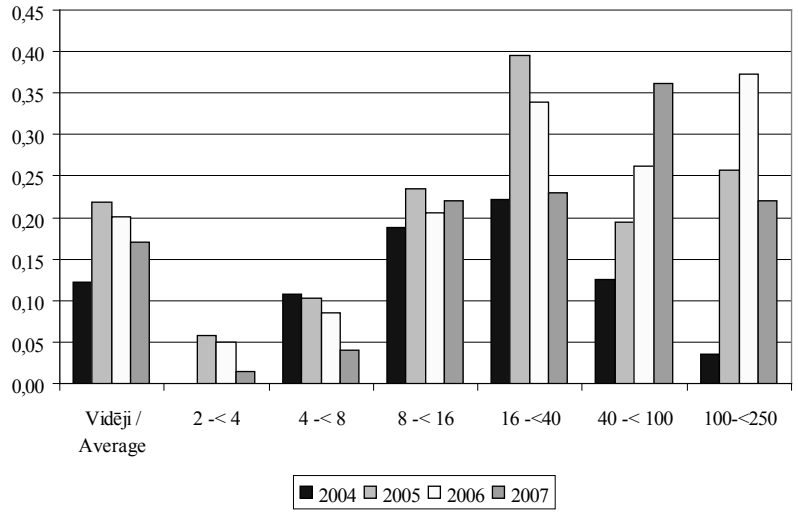
Pašizmaksas kalkulācijā bija iekļautas arī nealgotā darbaspēka izmaksas. Šāda pieeja, kad pašizmaksas monetārie posteņi tiek papildināti ar nemonetārajiem (*non-cash expences*), lai arī periodiski izpelnās kritiku, tomēr atbilst ekonomiski attīstītajās valstīs (t. sk. ASV Zemkopības ministrijas Ekonomisko pētījumu dienestā) izstrādātai lauksaimniecības produktu pašizmaksas kalkulācijas metodikai (Jesse E. et. al., 2003).

Ievērojot, ka saimniecības nesniedz un SUDAT datu bāzē nav informācijas par lopkopības specifisko izmaksu (lopbarības, apsēklošanas, veterinārās u. c.) sadali pa ražotās produkcijas veidiem, attiecināšanas likme bija noteikta, izmantojot saražotā piena vērtības īpatsvaru saimniecību saražotās lopkopības produkcijas vērtībā. Citi autori (Smith J. B., 1974; Gresley W., 1985) proporciju noteica, izmantojot pārdotā piena īpatsvaru saimniecības neto apgrozījumā.

Rezultāti un diskusija
Results and discussion

Viens no vadības grāmatvedības galvenajiem uzdevumiem ir produkcijas pašizmaksas (*product costs*) kalkulācija, jo tas ir svarīgākais adekvātās, taisnīgas un konkurētspējīgas pārdošanas cenas noteikšanas priekšnoteikums. (Нидлз Б. et. al., 2000; Селюков Ю. Н., 2007)

Analizējot piena ražošanas izmaksu struktūru, jāsecina, ka visās Latvijas piena lopkopības saimniecību grupās vislielākais īpatsvars bija lopbarības un darbaspēka izmaksām (1. tabula pielikumā). Pirktās lopbarības izmaksu īpatsvaram bija raksturīga tendence palielināties, pieaugot saimniecību ekonomiskajam lielumam. Salīdzinot ar 2004. gadu, 2007. gadā pašražotās lopbarības izmaksu īpatsvars visbūtiskāk bija sarucis vislielākajā (100 līdz 250 ELV) un vismazākajā (2 līdz 4 ELV) saimniecību grupā - par 11.9 un 11.3 procentpunktiem, kā arī saimniecībās ar ekonomisko lielumu no 8 līdz 16 ELV (par 9.5 procentpunktiem). Ja mazās saimniecībās darbaspēka izmaksas, kuru veidoja nealgotie darbinieki (ģimenes locekļi), sasniedza maksimumu, proti, $^{1}/_{3}$ no visu izmaksu kopsummas, tad, palielinoties saimniecību ekonomiskajam lielumam līdz 16 ELV, šo izmaksu īpatsvars saruka līdz 8 vai 9 %. Vidēji lielās un lielās saimniecībās tas atkal pieauga uz algotā darbaspēka izmaksu rēķina. Nolietojums līdztekus lauku saimniecību darbības tehniskā nodrošinājuma izmaksām (ēku un tehnikas uzturēšana, elektrība, apkure, degviela un smērvielas) ietilpa pēc izmaksu īpatsvara nākošajā lielākajā grupā. Analizējamā laika periodā nolietojuma ievērojams pieaugums dažās saimniecību grupās (it sevišķi 100 līdz 250 ELV un 8 līdz 40 ELV) labi raksturoja piensaimniecības sektorā notikušo ilgtermiņa ieguldījumu nomaiņas un atjaunošanas procesu (sk. 1. attēlu pielikumā), kad 2004. - 2006. gadā veiktie bruto ieguldījumi izraisīja nolietojuma atskaitījumu pieaugumu 2007. gadā. Svarīga loma ražošanas materiāli-tehniskās bāzes atjaunošanā bija ārējiem finansējuma avotiem, par ko liecina gan procentu maksājumu īpatsvara kopējās izmaksās, gan ilgtermiņa saistību īpatsvara pieaugums bilancē (sk. 2. attēlu). Tomēr ārvalstu pētījumos (Střeleček F., 2008) līdztekus Spānijai (0.039), Ungārijai (0.069), Lietuvai (0.081), Igaunijai



Avots: autoru aprēķini, izmantojot SUDAT datus

2. attēls. **Ilgtermiņa saistību īpatsvars bilancē Latvijas piena lopkopības saimniecībās pa ekonomiskā lieluma grupām (2004. – 2007. g.) / Long-term liabilities vs. total assets ratio for Latvian dairy farms (grouped by by ESU), 2004 - 2007**

(0.096), Itālijai (0.097) un Lielbritānijai (0.097) Latvija (0.089) ir ierindota to ES dalībvalstu grupā, kuru piena lopkopības saimniecībām ir viszemākā nolietojuma atskaitījumu attiecība pret ieņēmumiem. Tas liecina, ka Latvijā joprojām notiek ekstensīvā materiāli-tehniskā nodrošinājuma attīstība (*capital-saving type of technical development*).

No dažu speciālistu (Latvietis J. et. al., 2006a) izvērstās analīzes izriet, ka Latvijā, salīdzinot laika posmu no 1975. līdz 1980. gadam un pēc 2000. gada, piena pašizmaksā pieauga tādu izmaksu posteņu īpatsvars kā „Mašīnu iegāde un ekspluatācija" (no 5 līdz 15 %), „Būvju ekspluatācija" (no 3 līdz 10 %) un „Pārējās izmaksas, t. sk. veterinārie pakalpojumi" (no 14 līdz 20 %). Savukārt lopbarības izmaksu īpatsvars samazinājies no 50-55 līdz 40 %, darbaspēka izmaksu – no 20 līdz 10 %. Tas ir izskaidrojams ar pēdējos gados notikušo enerģētisko resursu, tehnikas iegādes un renovācijas, kā arī būvju ekspluatācijas sadārdzinājumu. 10 saimniecību, kuru ganāmpulkos izslaukums bija 3800 – 6500 kg no govs gadā, minēto autoru veiktais apsekojums ļāva secināt, ka izmaksas lopbarībai vidēji bija 38 % no kopējās pašizmaksas ar salīdzinoši lielām svārstībām – 25-51 %. Turklāt bija konstatēts (Latvietis J. et. al., 2006b), ka zemākais lopbarības izmaksu īpatsvars (līdz 46 %) ir ganāmpulkos ar zemākiem izslaukumiem (4500-5500 kg gadā), bet augstākais (44-50 %) - ar augstākiem izslaukumiem (6000-6500 kg gadā). Pēc LLKC[3] datiem (Graudiņš U., 2008) lopbarības izmaksas piena pašizmaksā veido 50-60 %, bet dažās saimniecībās, spēkbarību ražojot uz vietas, ap 30 %.

ASV Zemkopības ministrijas pētījums (Babb M. E., 1981) liecina, ka piena lopkopības sektorā ap 75 % no tiešajām izmaksām veido lopbarības izmaksas, kurām seko algotā darbaspēka izmaksas. *C. H. Burton* sagatavotajā (Burton C. H., 1976) fermai ar 80 govju lielu ganāmpulku pašizmaksas kalkulācijā (1968. – 1975. g.) lopbarības īpatsvars bija ap 58 %, darba izmaksu - 13 – 15 %, tehnikas un pakalpojumu - 4,5 - 7 %. Saskaņā ar citu autoru veiktajiem aprēķiniem (Jesse E. et. al., 2003) piena ražošanas pašizmaksas struktūrā pa ASV štatiem bija vērojamas diezgan lielas atšķirības: Viskonsinas, Aidahas un Kalifornijas štatos vislielāko īpatsvaru vidēji veidoja: lopbarība 28 %, 43 % un 50 % attiecīgi, nolietojums 22 – 25 % robežās, algotā un nealgotā darbaspēka izmaksas 31 %, 21 % un 15 % attiecīgi (t. sk. nealgotais darbaspēks 24 %, 13 % un 7 % attiecīgi), bet ēku un tehnikas uzturēšana, elektrība un apkure – ap 6 %. Veicot atsevišķu pašizmaksas posteņu mazāk detalizētu analīzi citos 12 ASV štatos,[4] vismazākais nolietojuma īpatsvars bija konstatēts Teksasas un Vermontas fermās (11-12 %), 2 štatos tas bija 13 - 14 %, 4 štatos – no 14 līdz 19 %, bet pārējos - ap 20 – 23 %. Ievērojams nolietojuma īpatsvars bieži ir izskaidrojams ar lielām investīcijām, rēķinot uz 1 govi, ja fermās dominē relatīvi nelieli ganāmpulki. Savukārt lopbarības izmaksu nevienādu īpatsvaru lielā mērā noteica gan dažādas cenas lopbarībai, gan arī tās atšķirīgais sastāvs. Vairumā štatu lopbarības izmaksas bija 30 - 40 % robežās un tikai Minesotā veidoja 25 %, bet Teksasā - 52 %. Vislielākais nealgotā darbaspēka izmaksu īpatsvars (virs 30 %) bija Pensilvānijas, Minesotas un Kentukijas štatā, vismazākais – Teksasā, Džordžijā un Ohaijā (7 - 11 %), bet vairākumā štatu 22 - 24 % robežās. Tāpat amerikāņu pētnieki atklāja interesantu likumsakarību: tajās ASV fermās, kurās pieskaitāmo izmaksu līmenis bija augsts, tiešās izmaksas bija mazas. Kā norāda lauksaimniecības ekonomikas speciālisti (MacDonald J. M., 2007), tieši pieskaitāmās izmaksas ir lielu saimniecību, kuras spēj izmantot savā rīcībā esošos resursus ar lielāko intensitāti, galvenā priekšrocība.

Vērtējot ar variācijas koeficienta palīdzību slaucamo govju skaita izmaiņas Latvijas piena lopkopības saimniecībās (2. tabula), jāsecina, ka vislielākās ganāmpulka svārstības bija vērojamas saimniecību grupā no 40 līdz 100 ELV (V = 25,3 %) un no 4 līdz 8 ELV (V = 21,4 %). 2004. – 2007. gadā piena vērtības īpatsvaram gan lopkopības produkcijas, gan kopējā produkcijas vērtībā bija tendence palielināties. Visnozīmīgākais pieaugums bija saimniecību grupā no 2 līdz 4 ELV un no 8 līdz 16 ELV. Tāpat īpatsvars konsekventi bija augstāks pēc ekonomiskā lieluma lielākajās saimniecībās, liecinot par izteiktāku specializācijas pakāpi. 1 litra piena pašizmaksa pārsniedza pārdošanas cenu lielākajā daļā lauku saimniecību. Analizējamā laika posmā šo saimniecību loks nepārtraukti paplašinājies: ja 2004. gadā pašizmaksa bija mazāka nekā pārdošanas cena saimniecībās ar ekonomisko lielumu virs 16 ELV, tad 2005. gadā – tikai saimniecībās virs 40 ELV. 2006. gadā gandrīz visās saimniecību grupās piena pašizmaksa pārsniedza pārdošanas cenu - vienīgi grupā no 100 līdz 250 ELV pašizmaksa bija vienāda, bet 2007. gadā – par LVL 0,04 mazāka, salīdzinot ar 1 litra piena pārdošanas cenu. Līdz ar to piena lopkopības sektors bija spējīgs turpināt darbību, tikai pateicoties saņemtajam ražošanas atbalstam, kura nozīme nepārtraukti pieaug. Vismazāko

[3] LLKC – Latvijas Lauku konsultāciju un izglītības centrs

[4] Džordžija, Ilinoisa, Indiāna, Kentukija, Minesota, Ņujorka, Ohaija, Pensilvānija, Virdžīnija, Teksasa, Tenesija un Vermonta

2. tabula.

Latvijas piena lopkopības saimniecībās ražotā piena pašizmaksas aprēķina raksturojošie rādītāji pa ekonomiskā lieluma grupām (2004. – 2007. g.) / Parameters of milk production costs calculation in Latvian dairy farms (grouped by by ESU), 2004 - 2007

Rādītājs / Parameter	Gads Year	Vidēji Average	2-<4	4-<8	8-<16	16-<40	40-<100	100-<250
Slaucamo govju skaits / Dairy cows	*2004*	*13*	*6*	*6*	*23*	*50*	*83*	*321*
	2005	15	6	10	25	53	134	371
	2006	*16*	*6*	*10*	*23*	*49*	*104*	*366*
	2007	14	5	8	16	32	78	234
Saražots piens (tonnas) / Milk produced (tonnes)	*2004*	*59.4*	*23.0*	*30.1*	*104.9*	*257.5*	*388.8*	*1687.0*
	2005	69.6	27.2	43.1	123.0	250.2	892.0	1918.9
	2006	*80.4*	*25.9*	*44.9*	*110.0*	*267.9*	*585.2*	*2391.6*
	2007	72.3	18.5	41.1	72.9	178.4	385.3	1696.9
Piena īpatsvars kopējā produkcijas vērtībā (%) / Proportion of milk in total output (%)	*2004*	*52*	*42*	*51*	*49*	*54*	*65*	*68*
	2005	53	45	42	59	60	66	69
	2006	*59*	*49*	*51*	*59*	*67*	*63*	*71*
	2007	61	56	56	62	62	63	73
Piena īpatsvars lopkopības produkcijas vērtībā (%) / Proportion of milk in livestock output (%)	*2004*	*79*	*67*	*76*	*78*	*83*	*84*	*89*
	2005	78	66	75	81	82	88	86
	2006	*80*	*68*	*76*	*80*	*86*	*84*	*86*
	2007	83	73	79	83	84	86	89
Piena pašizmaksa (sant./1 l) Costs of milk (sant./1 l)	*2004*	*15*	*18*	*16*	*14*	*13*	*13*	*14*
	2005	19	19	19	18	18	17	16
	2006	*19*	*20*	*19*	*18*	*18*	*21*	*18*
	2007	22	24	19	22	21	21	18
Ražošanas atbalsts (sant./1 l) Subsidies (sant./1 l)	*2004*	*4*	*4*	*4*	*4*	*4*	*5*	*3*
	2005	4	4	3	4	4	4	3
	2006	*6*	*5*	*5*	*6*	*6*	*6*	*4*
	2007	4	5	4	4	3	4	2
Pārdošanas cena (sant./1 l) Sales price (sant./1 l)	*2004*	*14*	*12*	*14*	*13*	*14*	*15*	*15*
	2005	16	15	16	17	17	18	17
	2006	*17*	*15*	*16*	*17*	*17*	*18*	*18*
	2007	19	17	19	19	20	19	21
Peļņa - zaudējumi (sant./1 l) Profit or loss (sant./1 l)	*2004*	*2.3*	*- 2.4*	*1.6*	*2.6*	*5.1*	*6.1*	*3.3*
	2005	1.6	- 0.5	0.0	3.4	2.3	5.1	3.9
	2006	*3.4*	*1.0*	*2.1*	*4.0*	*4.9*	*3.5*	*4.7*
	2007	1.4	- 2.1	3.0	0.4	2.1	2.7	6.3

Avots: autoru aprēķini, izmantojot SUDAT datus

saimniecību grupā no 2 līdz 4 ELV subsīdijas nebija pietiekamas, lai kompensētu pārdošanas cenas un ražošanas pašizmaksas starpību, tāpēc piena ražošana bija nerentabla (izņemot 2006. gadu).

Piena pašizmaksas kalkulācijas vienotās metodikas neesamība ievērojami sarežģī salīdzinošo analīzi. Piemēram, LLKC gadskārtējos izdevumos (Bruto, 2007) tiek aprēķināts vienīgi bruto segums.

Dažos avotos (Beļavnieks J., 2008) aprēķinātā piena pašizmaksa Latvijas statūtsabiedrībās nedaudz atšķīrās no kalkulētās šā pētījuma ietvaros. Proti, 1 litra piena vidējā pašizmaksa 2004. g. bija LVL 0.129, 2005. g. – LVL 0.159, 2006. g. – 0.165, bet 2007. g. – LVL 0.221 apmērā. Savukārt pēc J. Latvieša un J. Priekuļa (2006b) aprēķiniem piena pašizmaksa 2006. gadā svārstījās LVL 0.072-0.0139 robežās.

Latvijas zinātniskajā literatūrā (Latvietis J. et. at., 2006a) kā viens no lielas piena pašizmaksas mazajās saimniecībās iespējamiem iemesliem ir minēta novecojusi tehnoloģija un augsts roku darba īpatsvars. Nozīmīga loma pašizmaksas samazināšanā tiek piešķirta (Zujs V., 2005) lētu lopu mītņu izmantošanai, norādot uz nepieciešamību meklēt ekonomiski izdevīgus risinājumus septiņdesmitajos un astoņdesmitajos gados uzbūvēto piena lopkopības lielfermu rekonstrukcijai, jo pēc izvietojamo dzīvnieku skaita tās atbilst optimālajam mītņu lielumam. No V. Zuja pētījuma rezultātiem izriet, ka vismazākā piena pašizmaksa ir, lietojot govju nepiesieto turēšanu nesiltinātā kūtī, tomēr pašizmaksas atšķirības, izmantojot piesieto turēšanu siltinātā vai nesiltinātā kūtī, ir nebūtiskas (nepārsniedz 4.3 %). Tajā pašā laikā praktiķi (Beļavnieks J., 2008) norāda, ka lopu mītņu modernizēšanas un jaunu tehnoloģisko iekārtu iegādes nesamērīgi lielas izmaksas, kā arī nolietojuma atskaitījumi un kredīta procentu maksājumi nevis samazina, bet gan palielina saražotā piena pašizmaksu.

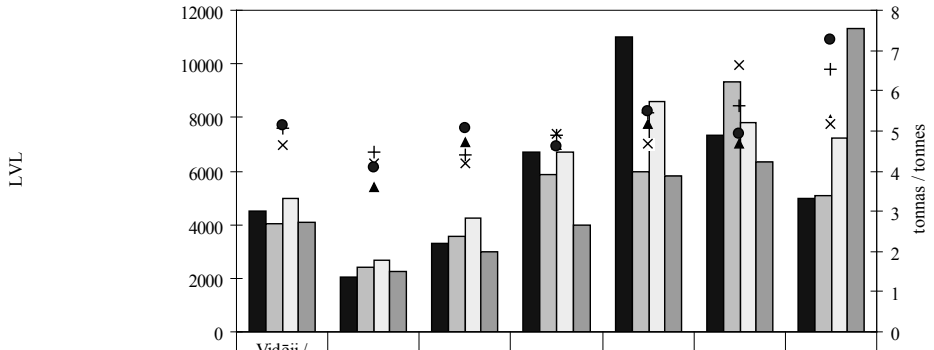
Literatūrā var atrast atzinumu (Smith B. J., 1974; MacDonald J. M., 2007), ka lielo ganāmpulku saimniecībās piena ražošanas pašizmaksa ir lielāka, nekā mazajās saimniecībās. Arī *L. W. Tauer* (2001) pētījumi to apstiprina, tomēr viņa veiktā ražošanas izmaksu modelēšana ar stohastisko izmaksu funkciju, izmantojot robežas (*frontier cost*) jeb labākās prakses izmaksu (*best practice cost*) un efektivitātes komponenti,[5] ļāva secināt, ka lielākā empīriski novērotu augstu izmaksu daļa ir saistīta ar mazu saimniecību neefektīvo darbību. Pieaugot saimniecību ekonomiskajam lielumam, saimniecību darbības efektivitātei ir tendence paaugstināties. Piemēram, novēršot neefektivitāti, 1999. gadā Ņujorkas štatā 50 govju lielajā ganāmpulkā 1 kg piena aprēķinātā pašizmaksa bija USD 0,299, bet 500 govju ganāmpulkā – tikai par 4 % mazāka, proti, USD 0,287. Vēlāk publicētajā pētījumā (Tauer L. W. et. al., 2006) atklāts, ka lielāks slaukšanas iekārtu izmantošanas ilgums dienā un tāda sistēma kā lopu ganīšana aplokos izraisa robežas izmaksu samazinājumu (bet vienlaicīgi samazinās arī efektivitāte). Savukārt slaukšanas zāles un dietologa (barību speciālista) pakalpojumu izmantošana pozitīvi ietekmē kopējās izmaksas, jo palielina efektivitāti. Jo vecāks fermeris, jo mazāka ir viņa darbības efektivitāte. Ganāmpulka vidējais lielums, saimniecības juridiskā forma, fermera izglītība, datorizēta slaukšanas un barošanas sistēma, kā arī barību testēšana neatstāja statistiski nozīmīgu ietekmi uz piena pašizmaksu.

Izmantojot analīzei ASV lauksaimniecības skaitīšanas datus (1959., 1964. un 1969. g.), *B. J. Smith* (1974) nekonstatēja likumsakarību starp piena pašizmaksu un no tā pārdošanas gūto peļņu 13 ASV dienvidu štatos, kurus aptvēra viņa pētījums. Skaidra un pozitīva sakarība bija saskatāma starp pārdošanas cenu un izmaksām – štatos ar augstu piena pašizmaksu produkcijas iepirkšanai bija noteiktas arī augstākas cenas. Šis secinājums saskanēja ar ASV Zemkopības ministrijas Ekonomisko pētījumu dienesta rezultātiem, par kuriem 1973. gadā ziņoja *D. E. Cummins* un *B. M. Buxton*. Citā uz FADN datu analīzi par 2000. – 2004. gadu balstītajā pētījumā (Střeleček F., 2008) sakarība starp piena pārdošanas cenu un ražošanas rentabilitāti arī netika identificēta (piemēram, Somijā un Zviedrijā arī visaugstākās cenas nekompensēja saimniecībām zaudējumus). Vairākumā dalībvalstu saimniecības spēja nodrošināt pieņemamu rentabilitāti, neskatoties uz zemu ražošanas produktivitāti. Saimniecību peļņa (zaudējumi) bija rezistenta pret piena realizācijas cenu īstermiņa svārstībām, daudz lielākā mērā to ietekmēja cenu izmaiņas ilgākā laika periodā.

Raksta autori konstatēja Latvijas piena lopkopības saimniecībās pozitīvo korelāciju starp piena izslaukumu un radīto neto pievienoto vērtību uz 1 nosacīto darbaspēka vienību (3. attēls).

Tā bija visciešākā 2005. un 2007. gadā ($r_{2005} = 0.928$; $r_{2007} = 0.924$), bet 2004. un 2006. gadā bija izteikta daudz vājāk ($r_{2004} = 0.700$; $r_{2006} = 0.711$). Analizējot rezultātus pēc saimniecību ekonomiskā lieluma, vislielākā pozitīvā korelācija bija konstatēta lauku saimniecībās ar ekonomisko lielumu no 100 līdz 250 ELV (r = 0.952) un no 2 līdz 4 ELV (r = 0.951), kā arī no 40 līdz 100 ELV (r = 0.899). Saimniecībās ar ekonomisko lielumu no 4 līdz 8 ELV tā bija negatīvā (r = -0.715).

[5] Robežas jeb labākās prakses izmaksu avots ir fermā izmantotās tehnoloģijas, bet efektivitātes komponenti ietekmē minēto tehnoloģiju prasmīgas izmantošanas pakāpe. Jo neefektīvāk pie konkrēta saimniecības lieluma tiek izmantota labākā prakse, jo vairāk šīs lauku saimniecības izmaksas pārsniedz labākās prakses izmaksas. Līdz ar to pašizmaksas samazinājums ir iespējams tikai labākās prakses efektīvas izmantošanas gadījumā.



	Vidēji / Average	2 - < 4	4 - < 8	8 - < 16	16 - < 40	40 - < 100	100 - < 250
■ NPV / NVA 2004.	4484	2051	3284	6732	11014	7338	4968
▨ NPV / NVA 2005.	4026	2398	3560	5891	5973	9321	5065
□ NPV / NVA 2006.	4969	2673	4257	6702	8576	7800	7209
▨ NPV / NVA 2007.	4082	2234	2985	3976	5822	6337	11325
▲ Izslaukums / Yield 2004.	4.6	3.6	4.7	4.6	5.2	4.7	5.3
× Izslaukums / Yield 2005.	4.6	4.2	4.2	4.9	4.7	6.7	5.2
+ Izslaukums / Yield 2006.	5.1	4.5	4.4	4.9	5.4	5.6	6.5
● Izslaukums / Yield 2007.	5.1	4.1	5.0	4.6	5.5	4.9	7.3

Avots: autoru aprēķini, izmantojot SUDAT datus

3. attēls. NPV uz 1 LDV[6] (LVL) un piena izslaukums (t) Latvijas piena lopkopības saimniecībās pa ekonomiskā lieluma grupām (2004. – 2007. g.) / NVA per 1 AWU (LVL) and milk yield (t) in Latvian dairy farms (grouped by by ESU), 2004 – 2007

Secinājumi
Conclusions

1. Latvijas piena lopkopības saimniecībās ražotā piena izmaksu struktūrā vislielākais īpatsvars bija lopbarības un darbaspēka izmaksām. Pirktās lopbarības izmaksu īpatsvaram bija raksturīga tendence palielināties, pieaugot saimniecību ekonomiskajam lielumam.
2. 2004. – 2007. gadā piena vērtības īpatsvars bija palielinājies gan lopkopības produkcijas, gan kopējā piena lopkopības saimniecību saražotās produkcijas vērtībā. Īpatsvars konsekventi bija augstāks pēc ekonomiskā lieluma lielākajās saimniecībās, liecinot par to vairāk izteiktu specializācijas pakāpi.
3. Saražotā piena 1 litra pašizmaksa pārsniedza pārdošanas cenu lielākajā lauku saimniecību daļā, turklāt analizējamā laika periodā šo saimniecību skaits pieauga. Proti, ja 2004. gadā pašizmaksa bija mazāka nekā pārdošanas cena saimniecībās ar ekonomisko lielumu virs 16 ELV, tad 2007. gadā – vairs tikai saimniecībās ar ekonomisko lielumu no 100 līdz 250 ELV. Līdz ar to piena lopkopības sektors turpināja darbību tikai pateicoties saņemtajam ražošanas atbalstam.

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[6] 1 LDV (nosacītā darbaspēka vienība) ir 1840 nostrādātās stundas gadā.

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Lauksaimnieciskās ražošanas un uzņēmējdarbības attīstības problēmas Latvijā
Problems of Development of Agricultural Production and Entrepreneurship in Latvia

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Abstract
The paper contains the research results on some production and entrepreneurship problems in Latvian agriculture. The characteristics and analysis of the situation in agriculture showed that there are considerable areas of unutilised agricultural land in Latvia, and the productivity is low. The entrepreneurs in agriculture have to face different factors, affecting the production. Expert methods may help in combination of these factors. Different models may be elaborated on the basis of the factor combination. These models are convenient for entrepreneurs, and allow taking into consideration the regional specifics.
Key words: agricultural land, factors, productivity, entrepreneur.

Ievads
Introduction

Joprojām svarīga prioritāte ir ievērojami drīza pietuvošanās ES valstu sociāli ekonomiskās attīstības līmenim, no kura Latvija turpina ievērojami atpalikt. Par to uzskatāmi liecina zemais iekšzemes kopprodukta (IKP) līmenis, rēķinot uz 1 iedzīvotāju, kas 2007. gadā sastādīja 58% no vidējā līmeņa ES, kas ir ceturtais zemākais rādītājs. No visām ES valstīm lielākais IKP uz vienu iedzīvotāju bija Luksemburgā, kur ES vidējais līmenis tika pārsniegts 2.8 reizes. Augsti IKP rādītāji ir arī Īrijā, kur ES vidējais rādītājs pārsniegts par 46%, Nīderlandē (31%), Austrijā (28%), Zviedrijā (26%), Dānijā (23%) un Beļģijā (18%).

Pietuvošanās ES vidējam līmenim nav iespējama bez visu tautsaimniecībā pastāvošo iespēju un potenciālu izmantošanas ikvienā nozarē un teritoriālajā vienībā. Latvijā viena no tādām pamatražošanas nozarēm ir lauksaimniecība, kas raksturīga visiem mūsu valsts reģioniem.

Šī materiālās ražošanas nozare, kas audzē lauksaimniecības kultūras un lopus, lai iegūtu augkopības un lopkopības produktus, un nodarbojas arī ar augu un dzīvnieku produktu pirmapstrādi, gadu gājumā ir izjutusi visas būtiskās izmaiņas, ko ir piedzīvojusi mūsu valsts tautsaimniecība kā apjomā, tā struktūrā, kas ir bijusi gan labvēlīga, gan negatīva. Būdama nozare, kuras attīstība kļuva strauja pēc pirmā pasaules kara un kas pēc otrā pasaules kara padomju perioda beigās bija pietuvojusies pirmskara līmenim, neatkarības atgūšanas periodā piedzīvoja kritumu, un 2000. gadā tās ražošanas apjoms bija samazinājies divkārt. 1990. gadā IKP struktūrā lauksaimniecība nodrošināja 21.1%, bet 2006. gadā – 3.2%. No eksporta nozares tā ir pārvērtusies par importa nozari un smagi izjūt ES ierobežojumus.

Nereti tiek runāts par lauksaimniecības atdzimšanu, pasvītrojot, ka šis process Latvijā ir ļoti vājš. Tāpēc aktuāls ir kļuvis jautājums par lauksaimnieciskā potenciāla attīstības pastiprināšanu.

Hipotēze: lauku uzņēmēju iesaiste un atbalstīšana lauksaimnieciskās ražošanas kāpināšanā var dot ieguldījumu nozares devuma kāpināšanā.

Pētījuma mērķis: noskaidrot problēmas, kas saistās ar lauksaimnieciskās ražošanas attīstību un risinājumiem.

Uzdevumi:
- raksturot situāciju nozarē;
- analizēt radušās problēmas;
- formulēt risinājumus.

Darbā izmantotās metodes: monogrāfiskā, statistiskās analīzes un eksperta metodes.

Pētījuma rezultāti
Research results

Lauksaimniecības produkcijas ražošana laika posmā no 1990. gada līdz 2006. gadam Latvijā kopumā samazinājusies turpat divkārt, ko galvenokārt ir izraisījis ražošanas samazinājums lopkopībā, kas sastādīja 32.0% no 1990. gada līmeņa. Ražošanas apjoms augkopībā šajā laikā samazinājies par 25.2%.

Ražošanas apjoma samazinājumu augkopībā radīja sējumu kopplatības samazināšanās, kas šajā laika posmā nokritās no 1627.0 tūkst. ha uz 1122,7 tūkst. ha jeb par 31%, tajā skaitā graudaugi – no 675.4 tūkst. ha uz 511.8 tūkst. ha jeb par 24.2%, kartupeļi – no 80.3 tūkst. ha uz 45.1 tūkst. ha jeb par 43.8%, bet garšķiedras lini – no 11.9 tūkst. ha uz 1.5 tūkst. ha jeb astoņkārtīgi. Rezultātā samazinājās arī graudu kopraža no 1599 tūkst. t 1990. gadā uz 1159 tūkst. t 2006. gadā jeb par 27.5%, kartupeļu kopraža no 1016 tūkst. t uz 551 tūkst. t jeb par 45.8%.

Galveno lopkopības produktu ražošanas apjoma krituma pamatā ir gaļas ražošanas samazinājums, kas ir nokrities no 308.5 tūkst. t 1990. gadā uz 79.7 tūkst. t 2006. gadā jeb gandrīz četrkārtīgi, kā arī piena ražošana, attiecīgi samazinoties no 1893.2 tūkst. t uz 815.1 tūkst. t jeb 2.3 reizes. Mazākā mērā ir samazinājusies olu ražošana – no 818.9 milj. uz 552.7 milj. jeb par 32.5%.

Attiecīgi samazinājās arī augkopības un graudkopības produktu ražošana rēķinot uz vienu iedzīvotāju. Ja 1990. gadā tika saražots 600 kg graudu un 382 kg kartupeļu, tad 2006. gadā attiecīgi 506 kg un 241 kg. Lopkopības produktu ražošanā uz vienu iedzīvotāju šajā pašā laika posmā gaļas ražošana samazinājās no 116 kg uz 35 kg, bet piena ražošana no 711 kg uz 356 kg.

Tajā pašā laikā ir redzams, ka novārtā ir atstātas iespējas lauksaimnieciskās ražošanas paplašināšanai. Pirmkārt, samazinās lauksaimniecībā izmantojamās zemes platības.

1.tabula
Table 1

Zemes lietojums Latvijā laika periodā no 2000. līdz 2006. gadam
The use of land in Latvia for the period of 2000 - 2006

	2000	2001	2002	2003	2004	2005	2006
Zemes kopplatība (tūkst. ha)	6458.9	6458.9	6458.9	6458.9	6458.9	6458.9	6458.9
Visas zemes (bez iekšzemes ūdeņiem)	6229.0	6229.0	6229.0	6229.0	6229.0	6229.0	6224.3
Izmantotā lauksaimniecībai izmantojamā zeme	1587.1	1581.6	1595.3	1581.4	1641.9	1733.5	1855.1
t.sk. aramzeme	969.9	958.2	972.8	956.4	1008.6	1091.8	1205.1
ilggadīgie stādījumi	11.5	12.1	12.2	12.0	12.4	12.8	13.2
pļavas un ganības	605.7	611.3	610.3	613.0	620.9	928.9	636.8
meži	2851.7	2868.2	2861.5	2877.2	2885.5	2904.4	2918.2
pārējie	1790.1	1779.0	1772.0	1770.0	1701.4	1590.9	1450.8
% pret kopplatību							
Zemes kopplatība (tūkst. ha)	100	100	100	100	100	100	100
Visas zemes (bez iekšzemes ūdeņiem)	96.4	96.4	96.4	96.4	96.4	96.4	96.4
Izmantotā lauksaimniecībai izmantojamā zeme	24.6	24.5	24.7	24.5	25.4	26.8	28.7
t.sk. aramzeme	15.0	14.8	15.1	14.8	15.6	16.9	18.7
ilggadīgie stādījumi	0.2	0.2	0.2	0.2	0.2	0.2	0.2
pļavas un ganības	9.5	9.5	9.4	9.5	9.6	9.7	9.9
meži	44.2	44.4	44.3	44.5	44.7	45.0	45.2
pārējie	27.7	27.5	27.4	27.4	26.3	24.6	22.5

Avots: autoru veidots pēc Latvijas statistikas gadagrāmatas 2007.

No Latvijas zemes kopplatības, kas sastādīja 6458.9 tūkst. ha, uz 2006. gada 1.janvāri lauksaimniecībā izmantojamā zeme aizņēma 2470 tūkst. ha jeb 38.2%, meži 2918.2 tūkst. ha jeb 45.2%, bet visas pārējās platības kopā 1070.7 tūkst. ha jeb 16.6%. No lauksaimnieciski izmantojamās zemes 72.9% sastādīja aramzeme, 1.2% augļu dārzi, 9.2% pļavas un 16.5% ganības. No pārējām zemes platībām purvi aizņēma 3.9%, zemes zem ūdeņiem 3.6%, krūmāji – 2.0%, ceļi un pagalmi – 3.5% un pārējās zemes – 3.8%. Teritoriāli visvairāk lauksaimnieciski izmantojamās zemes platības ir koncentrētas Latgales reģionā (27%), tālāk seko Vidzemes reģions (21.3%) un Zemgales reģions (20%). Vislielākais īpatsvars (69.3%) lauksaimnieciski izmantojamai zemei no lietošanā nodotās zemes ir Zemgales reģionam, vismazākais (51.6%) – Vidzemes reģionam.

Ja analizē zemes izmantošanu Latvijā ilgākā laika posmā, tad iezīmējas tendence, ka lauksaimniecībā izmantojamo zemju platības samazinās un meža zemju platības pieaug. Šī tendence ir noturīga ilgāk nekā pusgadsimtu. Ja 1940. gadā lauksaimniecībā izmantojamā zeme Latvijā sastādīja 3713.6 tūkst. ha jeb 56.4% no kopējās zemes platības valstī, tad 1950. gadā attiecīgi – 3352.3 tūkst. ha un 51.9%, 1970. gadā – 2907.8 tūkst. ha un 45%, 1990. gadā – 2567.0 tūkst. ha un 39.7%, bet 2005. gadā – 2406.0 tūkst. ha un 37.2%. 2007. gada beigās lauksaimniecības zemju platības sastādīja 38%, bet mežu platības sasniedza 45.5%. Šāda tendence ir novedusi pie tā, ka lielas lauksaimniecībā izmantojamās zemes platības pārvēršas par mežu zemēm, kas drīzi vien var aizņemt pusi no valsts teritorijas. Pie tam raksturīga iezīme ir tāda, ka prāvas lauksaimniecībā izmantojamās zemes platības tiek izmantotas ekstensīvi, bet daļa netiek izmantota vispār. Tā, piemēram, 2006. gadā no 2470 ha lielas lauksaimniecībā izmantojamās zemes platības izmantoti tikai 1855 tūkst ha jeb 75%.

Kaut arī pēdējos gados ir palielinājušās aramzemes platības (1.tabula), visu aramzemi joprojām sējumiem neizmanto. Tādēļ turpinās lauksaimniecības zemju aizaugšana, sasniedzot vidēji 10 tūkst. ha gadā. Tā rezultātā pasliktinās ainavu un biotopu kvalitatīvie rādītāji, kā arī degradējas hidromelioratīvās sistēmas.

Otrkārt, ražība un produktivitāte atpaliek no rādītājiem, kādi sasniegti citās valstīs (2.tabula). Ja 2005. gadā no 1 ha vidēji ieguva 2.8 t graudu, tad 1995. gadā tikai 1.69 t. Rapša sēklu ieguve svārstās no 0.81 t līdz 2.04 t no ha, kartupeļu no 11.5 līdz 14.6 t, dārzeņu no 10 līdz 14.2, garšķiedras linu – no 0.25 līdz 0.7.

Interesanti ir salīdzināt arī atsevišķu graudaugu kultūru ražību, kas sastāda: rudziem 2.63 t ha^{-1} – 1986. – 1990. gadā; 1.77 t ha^{-1} – 2000. gadā; kviešiem 2.86 t ha^{-1} – 2005. gadā; 1.77 t ha^{-1} – 1995. gadā; miežiem 2.26 t ha^{-1} – 1986. – 1990. gadā; 1.38 t ha^{-1} – 2000. gadā; auzām 2.14 t ha^{-1} – 1986. – 1990. gadā; 1.61 t ha^{-1} – 2000. gadā.

Augstākminētās kultūras pamatā arī veido sējumu platības Latvijā.

Šie kvalitatīvie rādītāji ir uzskatāmi par zemiem. Salīdzinājumam var minēt, ka, piemēram, 2003. gadā Spānijā miežu ražība sastādīja 2.7 t ha^{-1}, kas tiek uzskatīta par viszemāko ražību ES. Visaugstākā ražība bija Luksemburgā, kur tā sastādīja 6.8 t ha^{-1}. Visaugstākā auzu ražība bija Īrijā, sastādot 7.28 t ha^{-1} (http:www.agra-net.com). Ukrainā un Krievijā vidējā graudaugu ražība sastāda 3.5 t ha^{-1}, bet Kahazstānā pie vidējās ražības 1.9 t ha^{-1} atsevišķos reģionos tā sasniedz pat 5 t ha^{-1}.

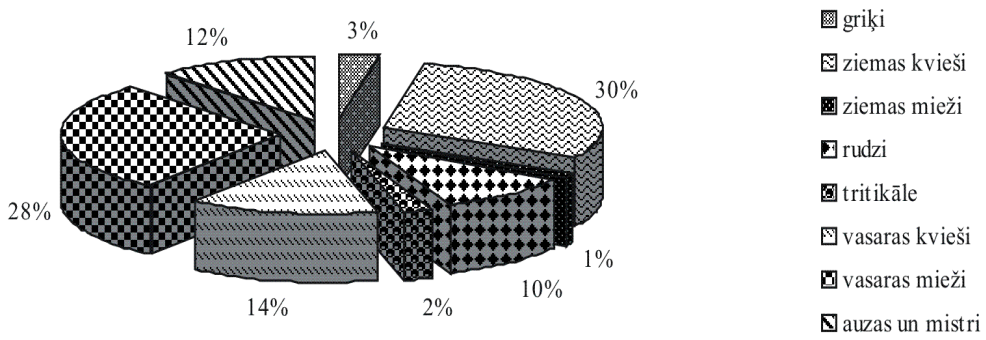
Augstākminētais liecina, ka ražošanas paplašināšana lauksaimniecībā var noritēt, racionāli kombinējot tās ekstensīvo un intensīvo attīstību. Šo procesu rezultāti ir atkarīgi no tā, cik veiksmīga būs uzņēmēja – lauksaimnieka darbība, cik prasmīgi un efektīvi tiks rasts kompromiss starp iekšējās un ārējās vides iedarbību uz uzņēmuma nosprausto mērķu sasniegšanu ražošanas platību izmantošanā un tās intensitātes kāpināšanā. Panākumi šī kompromisa rašanā būs atkarīgi no tā, cik veiksmīgi uzņēmējs, šis ekonomiskais aģents, kuru dēvē arī par ceturto

2. tabula
Table 2

Augkopības kultūru ražība Latvijā laika periodā no1990. līdz 2006. gadam
Yield of principal crops in Latvia for the period of 1990 - 2006

Ražība (t ha^{-1})	**1990**	**1995**	**2000**	**2005**	**2006**
graudi	2.37	1.69	2.2	2.8	2.26
rapsis	1.95	0.81	1.46	2.04	1.45
kartupeļi	12.7	11.5	14.6	14.6	12.2
dārzeņi	14.2	12.2	10.0	12.3	11.6
garšķiedra	0.25	0.55	0.7	0.58	0.4

Avots: autoru veidots pēc Latvijas statistikas gadagrāmatas 2007.



Avots: autoru veidots no ZM informatīvā ziņojuma 2007.

1.attēls. **Apsētās graudu platības struktūra 2008. gada ražai Latvijā (vasarāju platības – prognozētas)**
Figure 1. **Structure of sown areas in Latvia, 2008**

ražošanas faktoru, uztvers tirgus izdevības un kombinēs ražošanas faktorus tā, lai gūtu iespējami lielāku atdevi. Darbojoties dinamiskā un reālā vidē, kur peļņa ir atdeve nenoteiktībai, viņš cītīgi sekos brīvām nišām tirgū, lai tajā nodrošinātu savu vietu. Lai to īstenotu, viņam ir jāveic sekojošais:

- jānoskaidro faktiskās vajadzības pēc savas produkcijas, tās apjoma, steidzamības un slēptajām iespējām;
- kā uzņēmējdarbības centrālai figūrai jākombinē ražošanas faktori konkrētā vidē, kas dotajā brīdī var būt vairāk vai mazāk labvēlīga ražošanas organizācijai un tās intensifikācijai;
- jāvada un jākontrolē ražošanas norises, cenšoties saskatīt jaunās iespējas un likvidēt „šaurās" vietas;
- iespējami ātri jānogādā produkcija tās patērētājam.

R. Zvirgzdiņa veica aptauju un intervijas, kuru rezultātā varēja secināt, ka potenciāli būtu vērā ņemams jauno uzņēmēju skaits, kuri vēlētos pievērsties uzņēmējdarbībai lauksaimniecības nozarē. Kā svarīgākos priekšnoteikumus nozīmīguma ziņā viņi ir minējuši finanses un uzņēmību. Lai tuvāk noskaidrotu, kāpēc tieši šāds nozīmīgums piešķirts, autore intervēja atsevišķus respondentus, lai uzzinātu viņu viedokli. Kas attiecas uz finansēm, tad tika viennozīmīgi atzīts, ka lauku teritorijās trūkst līdzekļi investīcijām un ka šajā ziņā pastāv liela nevienlīdzība starp centriem un perifēriju, it īpaši starp Rīgu un no tās attālākajiem novadiem. Attiecībā uz uzņēmību intervētie respondenti pasvītroja, ka uzņēmējdarbības attīstība lauku teritorijās bieži vien ir veidojusies visai nelabvēlīgos apstākļos un ka šobrīd aktivitātes līmenis lauku teritorijās Latvijā esot zems, salīdzinot ar citām ES valstīm, un uzņēmējiem bieži vien vajagot saņemt visus spēkus un drosmi, lai uzsāktu un turpinātu uzņēmējdarbību konkrētā vidē. Daži intervētie pat apgalvoja, ka nereti tieši uzņēmēja uzņēmība ir izšķirošais faktors tam, vai uzņēmums spēs uzsākt un turpināt darbību.

Tika intervēti arī atsevišķi uzņēmēji, kuri no uzņēmējdarbības ir atteikušies, lai uzzinātu kādu iemeslu dēļ tas ir noticis. Kā galvenos iemeslus šie uzņēmēji minēja

- vāji attīstītu infrastruktūru;
- uzņēmējdarbības atpalicību no tās attīstības lielajās pilsētās;
- bezdarba, nabadzības un bezcerības pastāvēšanu no centriem attālākajās teritorijās;
- to, ka pilsētās ir uzņēmīgāki cilvēki, ņemot vērā, ka liela daļa uzņēmīgāko cilvēku no laukiem ir aizgājuši uz pilsētu;
- to, ka dažkārt nav viegli atrast cilvēkus, kas vēlētos strādāt par attiecīgu samaksu;
- stimulu nepietiekamību mērķa izvēlei.

Atteikšanos turpināt uzņēmējdarbību laukos, it īpaši augkopības un lopkopības ražošanā, kā arī vilcināšanos ar tās uzsākšanu ietekmēja arī tādi apstākļi kā pārejas perioda sekas, ES noteiktie ierobežojumi.

Pārejas periodā no plānsaimniecības uz tirgus ekonomiku Latvijā dažkārt pastiprināti valdīja priekšstats, ka valstij tikai minimāli ir jāiejaucas ekonomikā, paļaujoties uz tirgu kā perfektu pašregulējošu mehānismu. Pats pārejas process notika bez pietiekamas teorētiskās bāzes, kas liekama šādu procesu vadīšanas pamatā. Daudzi sākotnējie likumi, kas skāra uzņēmējdarbību veicinošas vides radīšanu Latvijā un uzņēmumu konkurētspējai pasaules tirgū, tika izstrādāti un pieņemti pārāk lielā steigā, kas dažkārt noveda pie negatīvām un pat neatgriezeniskām sekām, jo daudzos gadījumos likumos tika iestrādātas normas, kas nepietiekami aizstāvēja uzņēmēju intereses. Uzņēmējdarbības vidi reglamentējošās normas tika veidotas atrauti no Latvijas ekonomikas vispārnacionālā mērķa izstrādnes, jo nacionālās attīstības plāns tā vispārējos vilcienos tika izstrādāts

tikai 2003.gadā. Izstrādājot uzņēmējdarbību reglamentējošos likumus, nepietiekami tika ņemta vērā citu ES valstu pieredze.

Ne vienmēr tika savlaicīgi saskatīta principiālā atšķirība starp plānsaimniecības un tirgus ekonomikas pazīmēm, kas varēja būtiski ietekmēt normatīvo dokumentu izstrādi. Savlaicīgi neveidojās pietiekama izpratne par to, ka kolektīvisma principa vietā stājās individuālais princips, ka plānošanu valsts centrāles vietā veica atsevišķi saimnieciskie subjekti, ka komandsaimniecības vietā stājās cenu veidošanās tirgū, valsts īpašumu nomainīja privātīpašums, par uzņēmuma mērķi plānu vietā kļuva rentabilitāte, investīcijas vairs netika noteiktas plānā, bet par tām lēma uzņēmumi utt.

Latvijai kā ES dalībvalstij Latvijai ir jārēķinās ar ES spēkā esošajām likumdošanas normām un normatīviem dokumentiem. To ir daudz. Uz mūsu lauksaimniecisko ražošanu un tās attīstību vien attiecas vairāki simti ES Komisijas un Padomes regulas, kas saistās ar Kopējo lauksaimniecības politiku. Šo daudzo regulu rezultātā notiek lēns lēmumu pieņemšanas process, jo gan platības maksājumu, gan papildu valsts tiešo maksājumu saņemšanas nosacījumi pirms to apstiprināšanas Ministru kabinetā jāsaskaņo ar Eiropas Komisiju, līdz ar to atsevišķos gadījumos nav iespējams veikt nepieciešamos grozījumus Ministru kabineta noteikumos. Daudzos gadījumos tas neļauj lauksaimniecības nozarei ātrāk reaģēt uz tirgū notiekošajām pārmaiņām, atvieglot atbalsta maksājumu sistēmu zemniekiem. Turklāt Eiropas Savienības lauksaimniecības politikā norisinās viena reforma pēc otras. Nopietnākas reformas notiek reizi pāris gados, pie tam nākotnes skatījums ir neskaidrs. Gan veco, gan nu jau arī jauno Eiropas Savienības dalībvalstu lauksaimnieki ir noguruši no šīm pastāvīgajām neparedzamajām izmaiņām un neskaidrajiem spēles noteikumiem. Rezultātā lauksaimniecības politika ir tik sarežģīta, ka ir kļuvis neiespējami plašākai sabiedrībai izskaidrot, kādēļ un par ko lauksaimniekiem maksā atbalstu. Arī prasības ražošanai ir tik augstas, ka grūti saprast, kāds no tām labums.

Ražotāji būtībā ir spiesti strādāt pastāvīgās bailēs no sodiem. Ražojot ir jāizpilda virkne birokrātisku prasību, jāveic visdažādākā uzskaite. Lai saņemtu pieejamās kompensācijas un maksājumus, iespējams pieteikties atbalstam. Taču tad kontrolējošām institūcijām jāiesniedz detalizēti pārskati par saimniecībā notiekošajiem procesiem, kas daudzos gadījumos ir traucējoši. Jāievēro regulas, direktīvas un arī valsts normatīvie akti. Saimniecībā var ierasties virkne kontrolējošu institūciju un kontrolieri. Nekad nevar būt drošs, vai prasībās kaut kas nav mainījies, kāda uzskaite aizmirsta, vai viss laikā paziņots. Ja kaut kas nav izpildīts, saimniecībai piemēro soda sankcijas, dažkārt pat nesamērīgi lielas. Tā rezultātā dažkārt lielākā daļa ražotāju enerģijas aiziet birokrātisko prasību pildīšanai, bet nevis galvenajam – ražošanai un konkurētspējas nodrošināšanai tirgū. Līdz ar to agrāk vai vēlāk katram lauksaimniecības ražotājam rodas sajūta, ka vieglāk būtu pārtraukt šo un uzsākt citu nodarbošanos.

Pieņemot lēmumus par ražošanas uzsākšanu, turpināšanu un pilnveidošanu, uzņēmējs vienmēr ir spiests rēķināties ar konkrētiem apstākļiem. Viņam ir svarīgi, vērtējot to iedarbību, noteikt to svarīguma pakāpi. Lauku uzņēmumos, kas ir mazie uzņēmumi, to dara uzņēmuma īpašnieks vai vadītājs, pamatā liekot intuīciju un pieredzi. Taču šim nolūkam var izmantot tādas metodes kā ekspertu metodi, SVID u.c.

Pētījumā iesaistītā ekspertu grupa noteica 15 svarīgākos faktorus, kas varētu būt svarīgi lauku uzņēmējam un, izmantojot ekspertu metodi, eksperti novērtēja katra faktora iespējamo nozīmības pakāpi, izmantojot ekspertu vērtējumu apstrādes statistiskās metodes un pielietojot sekojošu formulu.

$$\nu_j = \frac{\sum_{i=1}^{k} vij}{k}$$

kur,

$\sum_{i=1}^{k} vij$ - ekspertu vērtējumu summa;

ν_{ij} - i-tā eksperta j-tā loģistikas infrastruktūras elementa vērtējums;

k – ekspertu skaits (Vasermanis E., Šķiltere D., 2003.).

Eksperti novērtēja faktoru nozīmību pēc ballēm, intervālā no 1 – 100. Datu apstrādes rezultātā katrs no nosacījumiem ieguva vidējo vērtību, un tie tika sagrupēti sekojoši: 100 – 80 – ļoti nozīmīgs elements; 80 – 60 – nozīmīgs elements; 60 – 40 – maznozīmīgs elements; 40 – 0 – nenozīmīgs elements. Aprēķinu rezultātā izveidojās sekojošs elementu sadalījums, kas atspoguļots 3. tabulā.

Par nozīmīgākiem faktoriem tika atzīti finansējums un zināšanas (ar vidējo novērtējumu 87 un 82 balles). Kā nozīmīgi elementi figurē darbaspēka pieejamība, informācija, infrastruktūra un konsultācijas (attiecīgi 78, 75, 70, 68 balles). Analizējot visus ekspertu vērtējumus kopumā, kļūst redzams to ciešums (no 87 līdz 35 ballēm).

Augstākminētie faktori var veidot dažādas sarežģītības pakāpes kompleksus, iedarbojoties savstarpēji, kā arī atkarībā no tā, kāda ir valsts un dažādu institūciju attieksme. Līdz ar to veidojas

3. tabula
Table 3

Faktoru nozīmības vērtējums
Evaluation of factors significance

Nosacījumi	Vidējais ekspertu vērtējums
Ļoti nozīmīgi elementi (100 – 80)	
Finansējums	87
Zināšanas	82
Nozīmīgi elementi (80 – 60)	
Darbaspēks	78
Informācija	75
Infrastruktūra	70
Konsultācijas	68
Mazāk nozīmīgi elementi (60 – 40)	
Interneta pieejamība	59
Dibināšanas procedūra	58
Nodokļu politika	55
Atbalsts MVU	50
Tirgus pieejamība	47
Konkurence	45
Vismazāk nozīmīgi elements (40 – 0)	
Izejvielu pieejamība	38
Ceļu tīkls	36
Valsts un pašvaldību atbalsts	35

Avots: autores pētījums un aprēķins

dažādi modeļi, kuros var ietvert dažādu faktoru skaitu, parasti svarīgākos. Šāds modelis tika izstrādāts kāda Zemgales reģiona uzņēmumam, kas paredzēja paplašināt ražošanu, ieviešot jaunas iekārtas.

Vispirms intervijas gaitā tika noskaidrots, kādi augstākminētie faktori dotajā uzņēmumā ir vissvarīgākie. Kā tādi tika atzīti sekojoši:

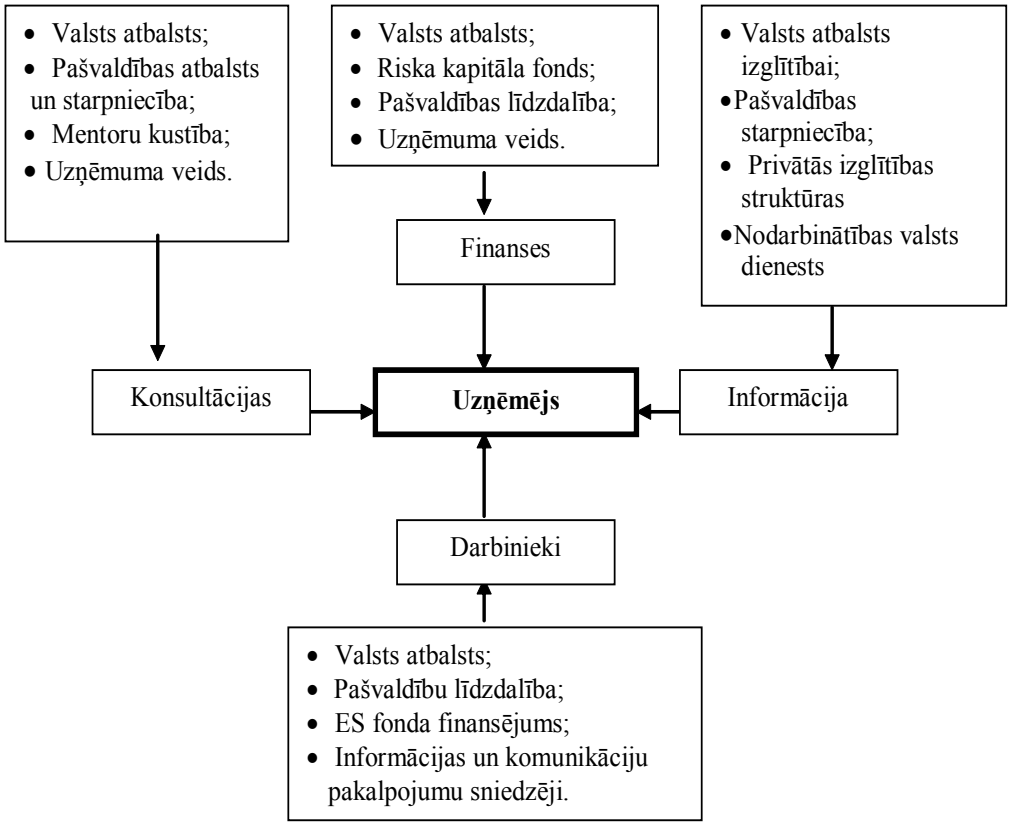
- Finansējuma jeb kapitāla pieejamība;
- Apkopotas un savlaicīgas informācijas pieejamība;
- Regulāru konsultāciju pieejamība un zināšanu papildināšanas iespējas;
- Kvalificētu un inovatīviem darbības virzieniem piemērotu darbinieku pieejamība.

Tālāk intervijas gaitā tika noskaidrots, kādi atbalsta pasākumi būtu nozīmīgi katram nosacījumam. Tā, piemēram, finansējumam par tādiem tika atzīti valsts atbalsts, riska kapitāla fonds, pašvaldības līdzdalība, uzņēmuma veids. Šāds modelis (2. attēls) ir vienkāršs un pārskatāms. Tas ļauj apzināt un ņemt vērā konkrētus apstākļus, kas ir svarīgi reģionālajā aspektā, un iegūtos rezultātus ir iespējams salīdzināt ar tiem, kādi ir iegūti tīri intuitīvi. Viena šāda modeļa piemērs parādīts 2. attēlā uz četru faktoru bāzes.

Rezultātā ražotājam paplašinās variēšanas iespējas, kuru izmantošana var kalpot saimniecības efektivitātes kāpināšanai.

Secinājumi
Conclusions

1. Lai pietuvotos ES vidējam sociāli ekonomiskās attīstības līmenim ir jāizmanto visas tautsaimniecībā pastāvošās iespējas un potenciāli ikvienā nozarē un teritoriālajā vienībā.
2. Latvijā ražošanas apjoma paplašināšanā potenciālas iespējas ir meklējamas vispirms lauksaimniecībā, jo šajā nozarē pastāv lielas neizmantotās lauksaimnieciski izmantojamās zemes platības un ražība ir samērā zema, vairākkārt atpaliekot no ražības, kāda sasniegta vairākās citās ES valstīs.
3. Ražošanas kāpināšanas rezultāti ir atkarīgi no lauksaimnieka prasmes kombinēt ražošanas faktorus, kas prasa attiecīgu kvalifikāciju.
4. Topošajiem un esošajiem uzņēmējiem, kuri pauž vēlmi pievērsties lauksaimniecībai un saskata ar to saistītās pozitīvās un negatīvās puses,



Avots: autoru veidots modelis

2. attēls. Uzņēmējdarbības aktivitāti ietekmējošo faktoru un to izpildi nodrošinošā atbalsta shematiskais modelis

Figure 2. **Schematic model of factors influencing the activity of entrepreneurship and their support**

nepieciešams sniegt vajadzīgo atbalstu.

5. Uzņēmējiem lauksaimniecībā, kuri joprojām smagi izjūt pārejas perioda sekas no plānsaimniecības uz tirgus ekonomiku nepieciešams nodrošināt mentoringa un konsultāciju pakalpojumus.
6. Problēmu risināšanā ir lietderīgi izmantot modernās metodes, ieskaitot ekspertu metodes.

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Assessment of Rapeseed Production in the Regions of Latvia and Farms of Different Size

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Abstract

Efficiency of economic results in rapeseed production is formed by many components, which can be grouped according to several features depending on the research aim, hypothesis and tasks. Economic aspects of rapeseed production are significantly influenced by productivity dynamics of oilseed rape sowings, changes in productivity levels, regional aspects of cultivation conditions, size of farms, and specialisation and concentration of production.

Three methods were used in the research: dynamic time-row analysis method to estimate crop productivity and growth of other parameters in a longer period of time, grouping method to investigate the influence of production concentration, and logical construction method.

It is recognised that large agricultural holdings are the most important rapeseed producers. Three fourths of the total rapeseed areas are concentrated in these enterprises accounting for 82% of the total yield produced by all rapeseed-production farms together. One fifth of the total area under oilseed rape belong to medium-sized farms; however the proportion of the total rapeseed yield obtained in this group of farms is by one third lower than that produced by large agricultural holdings. Insignificant number of small-scale farms is engaged in oilseed rape cultivation. Significant differences observed in rapeseed productivity levels among particular regions except natural (soil, climatic, etc.) factors are greatly affected by the applied amount of fertilisers and crop protection products. In meteorologically unfavourable years, yield decline in farms high in seed yields is considerably lower compared with lower productivity farms.

Key words: oilseed rape, seeds, yields, area.

Introduction

Efficiency of economic results in rapeseed production is formed by many components. These components can be grouped according to several features depending on the research aim, hypothesis and tasks. Agronomists usually study the impact of soil, crop management, technological and photosynthetic conditions on the crop yield level and seed quality formation process as well as economic usefulness of these factors. Management, concentration, and specialisation of production and economic assessment of the impact of logistic factors on the production process is in the focus of attention for managers and management specialists,. Economists have wider range of interests. Explanation of relationships between the impact of production resources and all other factors is included in the research complex of these specialists.

Due to limited size of this article, rapeseed production economic aspects are discussed conceptually assuming that yield economic efficiency level can be significantly influenced by:

- oilseed rape productivity dynamics, changes in productivity levels;
- regional aspects of cultivation conditions;
- economic size of commercial farms, specialisation and concentration of production;
- sales price of rapeseed;
- other conditions or resources.

Rapeseed production aspect is studied conceptually assuming that the increase of total rapeseed yield and economic efficiency can be influenced by:

- dynamics of sown area;
- changes in the yield productivity level;
- regional aspects of cultivation;
- economic size of commercial farms, specialisation and concentration of production;
- sales price of seeds;
- other conditions or factors.

The research aim was to analyse productivity dynamics of oilseed rape sowings, differences in productivity levels in regions and farms of different economic size and in variety testing trials as well as to estimate tendencies of growth, potentials and economic efficiency.

The following tasks were set to achieve the aim:

- to analyse productivity dynamics of oilseed rape sowings in Latvia over a period of 15 years;
- to assess rapeseed productivity levels in farms of different economic size;
- to provide comparative assessment of regional impact on oilseed rape cultivation economics;
- to investigate specific agro-technological costs in agricultural enterprises of different economic size in Zemgale 1 region and Latgale region.

Materials and Methods

The official statistical data from the *Central Statistical Bureau (CSB)*, an annual publication "Results of Economic Analysis of Agricultural Holdings" issued by LVAEI (Latvian State Institute of Agrarian Economics) within the framework of EUROSTAT unified system FADN (Farm Accountancy Data Network) and other materials were used in the research.

Three methods were mainly used in the research:

- dynamic time-row analysis used in crop productivity assessment and estimating the growth of other parameters in a longer period of time;
- grouping method for studying production concentration impact;
- logical construction method.

The indices of seed yields were used to analyse dynamics and productivity growth in oilseed rape sowings. Oilseed rape genetic capacity (breeding), growth and difference in productivity levels of technological efficiency in Latvia and in sowings of the state variety trials were studied in the research. The impact of several factors on oilseed rape productivity was analysed in the production area of Latvia agricultural enterprises:

- the impact of production concentration and specialisation;
- the impact of agrotechnical measures and technologies applied.

Results and Discussion

The average rapeseed yields in 1990 – 1997 accounted only for 1.25 t ha^{-1} (Table 1). In the following years significant rapeseed yield increase was observed, yet it was not stable and fluctuated markedly between years. Higher yields – 1.9 t ha^{-1} were attained in 2004 and particularly in 2005 when for the first time rapeseed yield somewhat exceeded 2 t ha^{-1} (2.04 t ha^{-1}). However, in 2006 the rapeseed yield index dropped to 1.45 t ha^{-1}. Based on seed yield averages of 1990 – 1997 to the year 2006, i.e., during 9 years, changes in the yield chain numbers (compared with the previous year) in three years (2000, 2003 and 2006) were negative. The highest productivity increase was observed in 1999 and 2004 by 35.3% and 31.9% respectively.

Grouping of productivity indices over 3-year periods is indicative of consequent growth; though the average productivity level is still comparatively low and economically low-efficient. The results of the previous three-year period allow optimistic forecasts for the following years.

Table 1

Dynamics of oilseed rape productivity in Latvia between 1990 and 2006

Years	Rapeseed yield, t ha^{-1}		Changes in yield chain numbers	
	In the years analysed	over a 3 year period	absolute	relative
1990-1997 (average)	1.25		-	-
1998	1.33	1.53	0.08	6.4
1999	1.80		0.47	35.3
2000	1.46		-0.34	-18.9
2001	1.54	1.59	0.08	5.5
2002	1.78		0.24	15.6
2003	1.44		-0.34	-19.1
2004	1.90	1.80	0.46	31.9
2005	2.04		0.14	7.4
2006	1.45		-0.59	-28.9

Source: the CSB database and author's calculations

Seed yields obtained from area unit and also total yield indices are dependent on many and different mutually connected factors. The size of oilseed rape breeders' farm, choosing economic size unit (ESU) index as a criterion, may be as one of the factors. The data on farms' economic size groups in 2006 as summarised in Table 2 indicate the following: the greater the farm the higher yield indices per ha. Assuming that the average seed yield 1.58 t ha^{-1} obtained in 2006 in large-scale agricultural enterprises with more than 40 ESU is 100%, and then with each following group – small-scale farm group seed yield indices significantly decrease. Thus in smaller-scale – 8≤40 ESU agricultural enterprises the seed yield accounted only for 69%, but in small enterprises (4≤8 ESU) only a half of the yield index of large-scale farms.

The larger area sown by oilseed rape, the higher productivity indices are concentrated in large-scale agricultural enterprises; wherewith the contribution of these enterprises in total yield account for 82.2%, i.e., this farm group has the leading position in rapeseed production in Latvia. On average, 99.2 tons of rapeseeds are produced in each of these farms. In agricultural enterprises of medium-large size (8≤40 ESU) the average contribution is 18.8 tons of seeds accounting for 15.6% of the total rapeseed yield in Latvia. This group of farms also can well be regarded as a serious player in rapeseed production. Rapid productivity increase, however, is needed to raise its significance in this farm grouping.

In small-scale agricultural enterprises the average rapeseed yield is very low – only 0.87 t ha^{-1} and only 2.6 tons of seed are produced per farm on average. It means that the average area sown by oilseed rape is below 3 ha per farm. Wherewith, the total contribution of this farm group in rapeseed production is also insignificant – only 2.1%.

The analysis of productivity indices in farm groups of different ESU show that small-scale farms and those of medium-large size are not capable of managing and applying effective professional technology and, obviously, are not technically ready for oilseed rape professional production.

At the same time it should be mentioned that rapeseed productivity level is rather low also in the largest agricultural enterprises. Further investigation is done analysing factors of regional influence considering essential ecological, social, soil and other differences in NUTS (Nomenclature of territorial units for statistics) 3 regions.

The results of productivity analysis in regions and sub-regions indicate that higher rapeseed yields are obtained in Zemgale 1 sub-region, at the same time they are with lowest yield fluctuations – 112% among farms of different economic size (Table 3).

In all regions in 2005 the rapeseed productivity level is lower in the farm group of 16≤40 ESU than that in the following farm group of 40≤100 ESU. In this farm grouping the productivity index among regions is more or less equalised except Latgale region with the lowest seed productivity index – only 1 t ha^{-1}. In the following farm grouping, i.e., 100≤250 ESU group, productivity dispersion among separate regions becomes considerably stronger. In this farm grouping the rapeseed productivity in all regions is somewhat lower compare with the previous farm group except Latgale region where insignificant yield increase is observed. It should be mentioned that oilseed rape is practically not cultivated in Pierīga and Zemgale 2 sub-regions in the farms of above 100 ESU, but in the farms of above 250 ESU oilseed rape is practically

Table 2

Productivity and total yield of oilseed rape in groups of different farm size in Latvia, 2006

Economic size groups of agricultural enterprises	Productivity of rapeseeds		Total yield of rapeseeds	
	t ha^{-1}	% to large-scale farm group	tons per 1 farm	%
Large-scale agricultural enterprises exceeding 40 ESU	1.58	100.0	99.2	82.2
Medium-large agricultural enterprises with 8≤40 ESU	1.09	69.0	18.8	15.6
Small-scale agricultural enterprises with 4≤8 ESU	0.87	55.1	2.6	2.1
Smallholder farms with less than 4 ESU	–	–	0.0	–
Average	1.45	–	120.6	100.0

Source: FADN LVAEI data and author's calculations

not cultivated in any region except Zemgale 1 region where the highest seed yields – 2.8 t ha^{-1} are attained. Obviously, profit is gained from other branches of production in these farm groupings.

In total, the year 2006 in all regions was characterised as unproductive, yet there is no expressed definite relationship between different regions and farm ESU groups. In small-scale farm group in regions where in 2005 higher yields were obtained – above 1.5 t ha^{-1}, significant yield decrease is observed, but in regions that are very low in productivity level (Pierīga 1, Latgale, Zemgale 2) equivalent or somewhat higher yield was also obtained in 2006. Farms included in 40≤100 ESU group experienced highest productivity decrease in 2006 compared with the previous year. It can be admitted that farms higher in productivity indices are more sensitive to unfavourable meteorological conditions.

Exact use of agrotechnical measures is of very great importance in oilseed rape cultivation. Plant nutrient supply and timely undertaken plant protection measures are one of the decisive stages in the complex of agrotechnical measures. Hence, it is interesting

Table 3

Productivity of oilseed rape in farms of different economic size regions and FADN sub-regions in Latvia, 2005 - 2006

Regions and sub-regions	Productivity of oilseed rape sowings in ESU farm groups, t ha^{-1}								Productivity dispersion (highest to lowest ratio), %	
	16≤40		40≤100		100≤250		>250			
Years	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
Pierīga 1	0.9	1.0	3.7	2.1	–	–	–	–	411.1	210.0
Pierīga 2	1.7	0.5	2.3	1.8	2.2	1.9	–	–	135.3	360.0
Vidzeme	1.7	1.1	2.1	1.0	1.8	2.1	–	–	123.5	210.0
Latgale	1.2	1.5	1.0	1.0	1.3	1.1	–	–	130.0	150.0
Kurzeme	1.9	1.2	2.6	1.0	1.7	1.6	–	–	152.9	160.0
Zemgale 1	2.2	1.8	2.6	1.5	2.5	2.0	2.8	2.1	112.0	140.0
Zemgale 2	0.6	0.8	2.3	0.7	–	–	–	–	383.3	114.3

Source: FADN LVAEI data and author's calculations

Table 4

Specific costs probably affecting oilseed rape diverse productivity levels in polarised regions in Latvia, 2005 - 2006

Indices	Years	ESU groups of farms						
		Zemgale 1				Latgale		
		16≤40	40≤100	100≤250	>250	16≤40	40≤100	100≤250
Costs of fertiliser per farm, LVL	2005	6441	17 050	53 774	207 261	5471	17 357	52 364
	2006	7292	19 868	44 906	187 263	4666	8968	57 116
Costs of fertiliser per 1 ha, LVL ha^{-1}	2005	61.93	65.08	80.26	91.26	26.95	36.54	43.64
	2006	60.56	82.96	79.52	89.23	29.83	22.54	48.13
Costs of crop protection products per farm, LVL	2005	3206	9346	30 919	109 334	1406	4255	7982
	2006	3430	11135	27329	93760	1535	3017	5434
Costs of crop protection products per 1 ha, LVL ha^{-1}	2005	30.83	35.67	46.15	48.14	6.93	8.96	6.65
	2006	28.49	46.49	48.40	44.67	9.81	7.58	4.58

Source: FADN LVAEI data and author's calculations

to compare costs among polarised regions spent for plant fertilisation and crop protection products applied in farms of different economic grouping. Thus in Zemgale 1 region the expenditure of funds used for plant fertilisation is more than 8-fold greater per farm in farm group 100≤250 ESU compared with farm grouping 16≤40 ESU (Table 4).

Equal situation is observed in Latgale region where the total amount of expenditures is somewhat lower, yet the tendency is corresponding to that observed in Zemgale 1 region and difference between the smaller and greater economic grouping farm is 9.6 times. To some extent, it is also understandable because of probably different farm size. Fertilizer costs per 1 ha land is a more expressing index. The difference among various economic grouping farms is also observed in increased expenditures devoted to plant fertilisation as seen in farms with increasing ESU group. So in Zemgale 1 region in farm grouping of 16≤40 ESU these fertiliser costs account for 61.93 LVL ha^{-1}, but with every following grouping fertiliser costs per 1 ha are increased by 5%, 23%, and 13%, respectively. To some extent, it also contributes to productivity increase. Similar tendency is also observed in Latgale region – increase between farm groupings is 35% and 19%.

In cultivation of field crops and particularly in oilseed rape cultivation fertilisers alone without crop protection measures cannot provide normal seed yields. In Zemgale 1 region, farm size increase results in rapid increase of crop protection products considerably outpacing the increase of expenditures used for plant fertilisation. Thus the increase between the farm group of smallest (16≤40 ESU) economic size and each one following it is 2.9, 9.3, and 3.5 times respectively, but between the lowest and highest farm economic size grouping this difference accounts for 34 times. In Latgale region, as well the increase in economic grouping size results in the increase of expenditures used for crop protection products by 3 and 5.7 times respectively. This increase rate however is lower compared with Zemgale 1 region and it is most important that in starting or base group of farms (16≤40 ESU) expenditures in Latgale region are 2.3 times smaller compared with Zemgale 1 region, but in the farm grouping 100≤250 ESU this difference increases up to 3.8 times. Also by costs of crop protection products per 1 ha land in Zemgale 1 region the use of crop protection products increases with the increase of the farm ESU group – difference between the lowest and the highest ESU group accounts for 1.5 times. In Latgale region, differences between ESU groups by costs of crop protection products per 1 ha do not exist practically being in the range from 6.65 to 8.96 LVL ha^{-1}. In Latgale region, cost of crop protection products per 1 ha in farms of different economic size groups are: 16≤40 ESU – 4.5 times lower, 40≤100 ESU – 4 times lower and 100≤250 ESU – 7 times lower compared with the corresponding economic group of Zemgale 1 region.

Fertilisation costs and particularly costs of crop protection products per area unit is a serious index for comparatively low rapeseed yields in Latgale region.

Rapeseed yield, to a great extent, is dependent on the zone of cultivation and choice of proper forms and varieties. Variety testing data are helpful in conditioned orientation in probable yield level in a definite zone. So in the past 6 years rapeseed yields obtained from the standard varieties in the study and research farm (SRF) "Jelgava", which is included in Zemgale 1 region, ranged from 3.1 t ha^{-1} in 2001 to 5.8 t ha^{-1} in 2004 (Table 5). It should be mentioned that recently the productivity of standard varieties is about or above 5 t ha^{-1}, except the unfavourable

Table 5

Genetic and technological potentials of rapeseed productivity

Sites of rapeseed cultivation and variety testing	Seed yield, t ha^{-1}					
	2001	2002	2003	2004	2005	2006
Productivity of winter oilseed rape standard varieties in SRF "Pēterlauki"	3.10	5.58	5.00	5.80	4.98	4.32
Productivity of winter oilseed rape standard varieties in Saldus PVTS trials	2.92	3.30	2.18	3.92	4.78	3.50
Productivity of spring oilseed rape early-maturing standard varieties in SRF "Pēterlauki"	–	–	–	4.28	3.06	3.26
Productivity of spring oilseed rape medium-late standard varieties in SRF "Pēterlauki"	–	–	–	3.78	2.70	2.94
Average productivity of total area sown to oilseed rape in Latvia	1.54	1.78	1.44	1.90	2.04	1.45

Source: data of Saldus PVTS and SRF "Pēterlauki" and author's calculations

Table 6

Yields of rapeseed and cereals in 2005 and 2006, t ha^{-1}

Crop	Average yield, t ha^{-1}		Ratio of the yield of 2006 to the yield of 2005, %
	2005	2006	
Rapeseed	2.04	1.45	71.1
Winter wheat	3.77	3.03	80.4
Winter barley	3.06	2.02	66.0
Spring wheat	3.22	2.18	67.7
Spring barley	2.45	1.99	81.2
Oats	2.10	1.46	69.5
Winter rye	2.22	2.73	123.0

Source: the CSB database and author's calculations

year 2006. Plant variety testing results obtained in Saldus Plant Variety Testing Service (PVTS) are rather unpretentious – seed yield difference accounts for 1 to 2 t ha^{-1}, though recently the productivity increase is observed. Seed yields of spring and winter rape obtained in the study and research farm (SRF) "Jelgava" indicate that forms of oilseed winter rape show higher indices over all the years in the period from 2004 to 2006. At the same time the productivity of oilseed spring rape early-maturing standard varieties is higher than the productivity of medium-late oilseed spring rape standard varieties.

The data summarised in Table 5 indicate that the average productivity of total area under rapeseed in Latvia is far behind variety testing indices. It means that just implementation of all necessary agrotechnical measures enables rapid productivity increase in total in Latvia.

As mentioned before, rapeseed yield level similar to that of other field crops depends on the meteorological situation and is greatly due to the character of the vegetation period. The year 2006 is admitted as particularly unfavourable for field crop cultivation, when all the field crop species, except winter rye, produced considerably lower yields compared with other years (Table 6).

Species of various field crops (cereals) had different response to the meteorological situation. Winter wheat and spring barley were less sensitive – 20% was the average yield decrease in Latvia in 2006 compared with the previous year 2005. Rapeseed is considered as being comparatively sensitive to unfavourable weather conditions – its productivity decrease was almost in the range of 30%. Equal productivity decrease or even somewhat higher one was observed in oats, spring wheat, and winter barley.

Conclusions

1. The main rapeseed producers are large-scale agricultural enterprises the sowings of which account for three fourths of the total area sown to oilseed rape in Latvia, while the total seed yield accounts for 82% of the gross yield produced by all rapeseed production farms.
2. One fifth of the total oilseed rape area is cultivated by a medium size farms, yet the total seed yield proportion in this farm group is by one third lower as that in large enterprises.
3. Small farms are insufficiently engaged in oilseed rape production, while smallholder farms are not engaged at all.
4. Particular attention is paid to great differences in rapeseed productivity levels among farm groups as productivity in large-scale farms is twice as high as in small farms and by one third higher than that in farms of medium size.
5. Differences in rapeseed yields among various regions are affected not only by diverse soils and other natural factors, but also, to a great extent, by the amount of fertilisation and crop protection products applied per area unit.
6. Oilseed rape is one of the field crops which is most sensitive to unfavourable climatic fluctuations, the higher yields, the relatively smaller productivity dispersion.
7. Proper use of all necessary agrotechnical measures in Latvia enables probability of rapid oilseed rape productivity increase as indicated by the results of the state variety testing. Topicalities recommended for taking real opportunities:
   7.1. improvement of agronomical and technological competence among rapeseed producers;

7.2. exact consideration of production technology in all processes;
7.3. choice of a variety most suitable to a region of definite natural conditions.

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Cost Optimisation of Biomass Transformation in the Biogas Process

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Abstract
Nowadays, energy production is characterised by the domination of fossil energy sources. However, increasing costs, exhausted resources and environment pollution enforce significant changes within the energy sector in the following 10 years. In Hungary, huge amounts of by-products and waste are produced in the agricultural sector. [5] Their usage and effective management can provide energy sources in a long-term, at the same time fostering regional job creation [8].
In our research the input, transformation and output activities of a biogas plant were modelled with the GNF (Generalised Network Flow) method. The plant is based on a 1000-sow farm with slurry system. Other inputs in the area can comprise silage maize, sweet sorghum, grass silage, and by-products of green pea processing. Transforming process in the biogas plant has two steps. During the first step, the input material is digested, while during the second step, transforming processes are carried out according to the various utilisation forms of the biogas and the fermented manure. Products from the biogas production are as follows: clean biogas, electricity, heat, and their combinations. The fermented material can be utilised in homogenised form, or as separated liquid and dry phases.
Our aims were to optimise the processes with minimum costs. The analysis of shadow prices and the sensitivity analysis lead to the determination of marginal costs of the input materials and economic transport distances. This model allows decreasing the cost of biogas production as well as deciding on the plants to be grown, thus increasing the competitiveness of green energy production.
Key words: biogas, optimisation, competitiveness, linear programming.

Introduction

On biogas in general

Biogas is a gaseous material produced by methane-producer bacteria during the biological breakdown of organic matter in the absence of oxygen, which is the result of hydrocarbon-chains' oxygen free disintegration – in the literature references called fermentation. This process also occurs in nature almost everywhere, where there is not enough oxygen for the organic material [9]. A similar phenomenon takes place in the wetlands, marshlands or in the digestive system of ruminants. In the course of our literature overview we found that biogas production is an advantageous solution for the disposal of biological wastes from the economic and environmental point of view [10].

Every organic matter that can be easily breakdown by bacteria generates biogas. Mostly slurry and manure – substrate – are used as raw material in the biogas plants of agriculture. The slurry of swine, due to its high buffer-capacity, can keep the biological processes among optimum conditions (pH) [1]. In addition other materials can be used to enhance biogas production. Maize, cereals or grass can be used for biogas production from agricultural products. We have the opportunity to grow energy plants on set-aside lands that can also be utilised by the biogas plant. Food industrial by-products – for example, tankage, fat separator waste, rape, sugar-beet slices, etc. – can also be processed into the biogas. Green cropping waste, the organic part of sorted municipal waste, waste from restaurants and sewage-sludge are also suitable for biogas-production.

In the course of our study we used the slurry produced by animal husbandry, and silage maize, sweet sorghum, grass silage from the field crops, while

green pea cod was used as raw materials from the by-products of crop sector's green wastes. We took into consideration the fact that different raw materials of plant production generate biogas of various quantity and quality. From technological point of view it was important to determine the compound of raw materials with adequate dry matter contents, while from the economic point of view the utilization of wastes with high fat- and carbohydrate-content was favourable, namely, significant quantity of methane can be gained which on contrary is a raw material generated by the production of biogas.

Two significant strategic solutions are known for the energy extraction from the process of biological origin wastes. In the aerobic approach microbes utilise organic matters in the presence of oxygen. In this case the end-product of composting process is stabilised biomass that can be used as fertiliser substitute. The other strategy is the anaerobic approach which means the breakdown of organic matters in the lack of oxygen [4]. During the process of anaerobic degradation, besides the stabilised biomass, primarily biogas is produced which can be transformed to energy with suitable technological solution. This energy can be connected to a suitable electrical power source. 1 Nm^3 biogas is equal to 6 kWh, which is equivalent with the energy source containing 23 MJ of energy. Of the two strategies we chose the anaerobic one, while in the aerobic composting process carbon-dioxide is generated which is a greenhouse gas.

The compound of produced biogas during the process is the following: 50-70% of methane; 35-45% of carbon dioxide; 0.0-0.2% of hydrogen, nitrogen, sulphur-hydrogen, and other residue gases.

The operation of the biogas plant

In most cases biogas plants consist of a pre-storage tank, one or more fermentors – biogas-reactor – and a post-storage tank. In cases where solid organic matters are also utilised the comminution, dilution and homogenisation of these happen before the insertion into the fermentor in the biogas power plant. In the fermentor the organic matters are demolished by bacteria with the lack of oxygen. The produced biogas in this phase has to be purified before utilisation, later it is stored for a short period of time before it is burned away in a steam plant and electricity, and heat is produced from it.

Basically, the whole process of biogas production has two sections: the first one is a fermentation biochemical process, which means the demolition, and digestion of macromolecular organic matters; the other one is the biochemical process of methane formation. Recent studies show that there is a acetogenic biochemical process between the former two processes in which the materials formatted during the phase of acid formation are transformed to acetic acid. The separation of these has a rather theoretical significance, while it is proved that the acetogenic microorganisms – acetic acid producing bacterium – needed for the intermediate process could only live in symbiosis with the methane producers. In essence it is sufficient to handle this intermediate process as a part of the second phase.

We can group the 'executor' bacteria according to the two phases of biochemical process. The executors of the fermentative process are called acid producer bacteria, and the methane producer bacteria are called methanogenic bacteria.

The microorganisms contributing in the process of methane formation are very sensitive to toxication. Toxic substances in the raw materials can cause fast loss of activity [6].

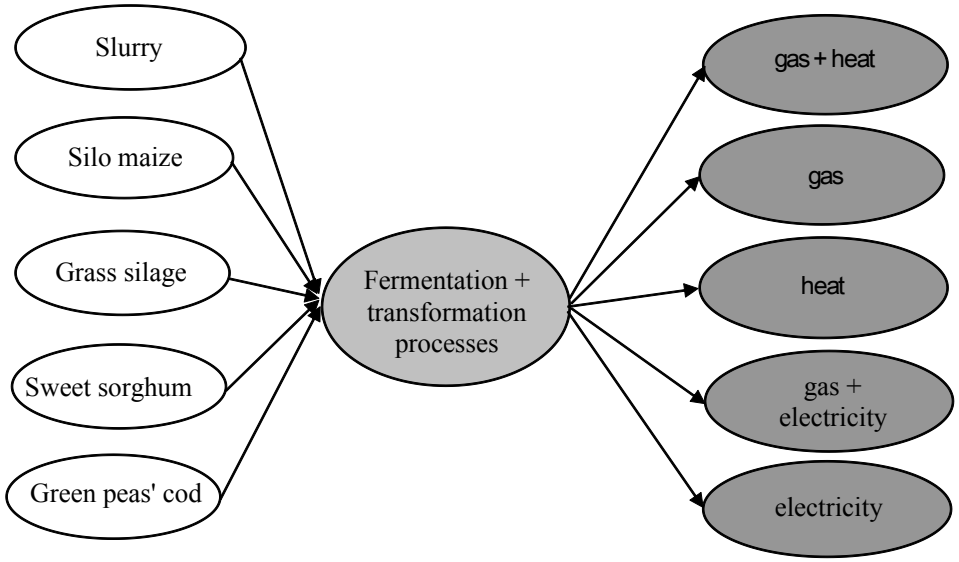
The start of the rotting process can be observed at 0˚C that grows rapidly during the process and often reaches 30-37˚C which can be considered as the relative maximum. The temperature is closely related to the efficiency of organic matter's demolition, while the pace of gas production rises and the time of stabilization shortens with the growth of the temperature. It is understood 15 days stabilization time is needed that for the temperature of 30˚C, hence the most rotters are proportioned for 15 days of residence time, which ensures appropriate stabilisation [2].

The utilisation of biogas is the same as natural gas' or PB-gas'. Accordingly, the primer utilisation fields of biogas are the following: heating, cooking, hot water production for households, and for agricultural activities refrigeration, the direct operation of stable machineries, producing electricity from biogas, and its usage for lighting or for operating industrial machineries. On large biogas-producing plants the utilisation can be directly in the form of gas energy, by combustion, electricity production from gas, after gas purification and degreasing its input into natural gas networks and as liquid fuel (methanol) as well.

Methods

We defined the processes of the biogas plant as a network problem, and we modelled it accordingly [3]. The nodes of the model are the input materials, the transformation processes and the possible end-products. The schematic display of the network is shown in Figure 1.

The nodes of net power are the constraints of the model, while the variables are the edges between the nodes (material flows).



Source: made by the authors

Figure 1. **The scheme of the mode**

1. Constraint for raw materials

$$-x_j \geq -b_i \text{ where} \qquad (1.1)$$

x_j : the quantity of j^{nth} raw material to be used (tons)

b_i : the quantity available from the i^{nth} raw material (tons)

For the quantity of the slurry we determined the equality bid instead of a minimum one due to the requirement to use up everything.

2. Constraint for fermentation

$$\sum a_j x_j - F = 0 \text{ where} \qquad (2.1)$$

a_j : the relative quantity of biogas which may be produced from the j^{nth} raw material (m^3/t)

x_j : the quantity of j^{nth} raw material (tons)

F : the quantity of produced raw biogas during fermentation (m^3)

3. Constraints for transformation processes

$$\begin{aligned} F - \sum y_k &= 0 \\ \lambda_{lk} y_k - z_p &= 0 \end{aligned} \text{ where} \qquad (3.1, 3.2)$$

F : the quantity of produced raw biogas during fermentation (m^3)

y_k : the quantity of utilised raw biogas in the k^{nth} transformation process (m^3)

λ_{lk} : efficiency coefficient of the k^{nth} transformation process' length sub-process ($0 \leq \lambda \leq 1$)

z_p : net biogas quantity during (lk-p) transformation process produced p^{nth} output used for energy production (m^3)

4. Transformation of the unit of measurement

$$-6{,}3889 z_p + output_s = 0 \text{ where} \qquad (4.1)$$

$6{,}3889 z_p$: the quantity of net biogas converted in kWh that can be used for energy production during the transformation process

$output_s$: net saleable energy in kWh in the course of (p-s) unit of measurement's transformation

5. Other constraints

Dry matter minimum: $\sum g_j x_j \geq \gamma \sum x_j$ where (5.1)

g_j : dry matter content of j[nth] raw material (%)

x_j : quantity of j[nth] raw material (tons)

γ : expected minimum level of the inputs' dry matter content (%)

Size constraint: $\sum output_s \leq Capacity$ (5.2)

The model's objective is the maximisation of the biogas plant's annual profit contribution. As variable costs we took into consideration the value of the utilised raw materials, relative labour costs of transformation processes, and the relative maintenance costs. For the calculation of revenues we multiplied the value of sales ($output_s$) variables with the kWh/Ft prices in the objective. We determined the prices according to 56/2002 (XII.29.) GKM regulation.

Results and Discussion

The investment of biogas plant is connected to a 1000-sow farm and the utilisation of its slurry Transformation process in the biogas plant has two steps. During the first step, input material is digested, while during the second step, transforming processes are carried out according to the various utilisation forms of the biogas and the fermented manure. Products from the biogas production are the following: clean biogas, electricity, heat, and their combinations. The fermented material can be utilised in homogenised form, or as separated liquid and dry phases. In our model we took only into consideration the energy production, and we set up our model accordingly to this consideration (Table 1).

In the course of running the model we did not examine the opportunity of possible energy types one by one but together, in the context of them.

As a result of the model we got a profit contribution of Ft 75 million. Considering the fact that the depreciation and other fixed costs of such a biogas plant equal to Ft 60-65 million annually, we can calculate Ft 10-15 million of profit in a year.

The marketing of heat produced in gas boiler (91%) and the gas produced in gas purifier (9%) are proven to be a competitive solution. Combined production of electricity and heat by gas engine does not pay off due to the relatively high losses. However, reduced costs provide valuable information for us (Table 1).

The production of heat would dominate even in the case of the heat price reduction. Methane reduction is even more sensitive to the occurring price reduction, because in the case of the price reduction of 10% it would get out of the production structure. The production of electricity is only in question at better market perception, although fast technological improvement should also be considered on the field of biogas industry. Further advances of the efficiency of transformation could significantly change the production structure.

In the case of utilised raw materials in the production we determined equality for the slurry, and for the determination of other raw materials' (silage maize, sweet sorghum, grass silage and green peas' cod) costs we calculated with an average transport cost of 30 km. With these parameters the grass silage

Table 1

The setting-up of the model

Nodes		Variables						...		Used	Relative	Capacity	Measure
		10-60	20-60	30-60	40-60	50-60	60-70		120-170				
10	Hog slurry	-1						...		-21 888	=	-21 888	tons
20	Silage maize		-1					...		0	>=	-15 000	tons
30	Grass silage			-1				...		-11 520	>=	-12 000	tons
40	Sweet sorghum				-1			...		0	>=	-110 000	tons
50	Green peas' cod					-1		...		0	>=	-5 000	tons
60	Fermentatiom	20,4	185,3	182,3	90,1	80,1	-1	...		0	=	0	m^3
70	Transformation processes						1	...		0	=	0	m^3
80	Gas purification + gas							...		0	=	0	m^3
90	Gas purification + heat							...	-1	0	=	0	m^3
100	Gas boiler + heat							...		0	=	0	m^3
110	Gas engine + electricity							...		0	=	0	m^3
120	Gas engine + heat							...		0	=	0	m^3
130	Heat energy1_sale							...		0	=	0	kWh
140	Gas_sale							...		0	=	0	kWh
150	Heat energy2_sale							...	-0,32	0	=	0	kWh
160	Power_heat							...		0	=	0	kWh
170	Heat energy3_sale							...		0	=	0	kWh
Dry matter min		0,06	0,33	0,35	0,18	0,15		...		5 345	>=	5 345	tons
Objective		-750	-6 000	-4 100	-3 000	-2 000	-3,8	...	-2,9	75 089 847			
Result (t; m^3;kWh)		21 888	0	11 520	0	0	2 546 611	...	25 084				

Source: authors' calculations

Table 2

Sensitivity analysis of marketing variables

	Objective	Lower bound	Upper bound
Heat-energy	22,00	9,67	
Gas	25,00	22,58	
Electricity	24,00		27,66

Source: authors' calculations

was competitive and the other materials did not get into the production structure. Reduced costs are above Ft 2.000 for each plant which means that the given distance of transport is too high. The utilization of these plants is economic only in the case if these are produced around the field of hog holding or the biogas plant. But it is necessary to add that the use of green peas' cod can only be a coerce solution, because it is produced not directly around the plant.

Conclusions

In our research the input, transformation and output activities of a biogas plant were modelled with the GNF (Generalized Network Flow) method. Our aims were to optimise the processes with minimum costs. Marginal costs of the input materials and economic transport distances can be determined in the analysis of the shadow prices and the sensitivity analysis. This model makes possible to decrease the cost of biogas production, and to decide on the plants to be grown, thus increasing the competitiveness of green energy production.

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Pārtikas rūpniecība un tās produkcijas eksports
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Abstract
Food industry is one of the most important sectors in Latvian economy. Its orientation to exports may provide a considerable contribution to the increase of production potential and balanced territorial development. The paper analyses the role of Latvian food industry, the possible impact of transition period and globalisation on it, and tries to give some forecasts for its further development. Especially, the paper underlines the necessity to pay more attention to accelerate development of food industry in Latvian regions.
Atslēgas vārdi: pārtikas rūpniecība, produkcijas eksports
Keywords: food industry, export of products.

Ievads
Introduction

Pietuvošanos ES vidējam sociāli ekonomiskajam līmenim, kas ir viena no galvenajām Latvijas prioritātēm, var ievērojamā mērā sekmēt visu ražošanas nozaru, tajā skaitā arī pārtikas rūpniecības ieguldījums, ražojot produkciju gan vietējam patēriņam, gan eksportam.

Latvijā pārtikas rūpniecības produkcijas eksportam dažādos laikos vienmēr ir bijusi redzama vieta, un eksports, no vienas puses, ir veicinājis ražošanas paplašināšanu un visu resursu efektīvāku izmantošanu, bet, no otras puses, tas ir stiprinājis produkcijas konkurētspēju.

Dažiem no Latvijā ražotajiem pārtikas produktiem savulaik ir bijusi vērā ņemama vieta pasaules tirgū, kā tas, piemēram, bija mūsu valsts pirmās neatkarības periodā, kad Latvija sviesta eksportā 1937.gadā sekoja tūlīt aiz Dānijas, Holandes, Zviedrijas un Īrijas (Latvija citu valstu saimē, 1990).

Produkcijas eksports, būdams atkarīgs no daudz un dažādiem iekšējiem un ārējiem apstākļiem, vienmēr saistās ar tiem vai citiem faktoriem, kam var būt dominējoša loma un ar kuriem noteikti jārēķinās, pievēršoties produkcijas ražošanai eksportam. Latvijā šobrīd par tādiem var uzskatīt: ražošanas apjomu izmaiņas pēc neatkarības atgūšanas, pārtikas rūpniecības uzņēmumu tehnoloģisko līmeni un risinājumus reģionalizācijas kontekstā kā pretmetu globalizācijai.

Hipotēze: pārtikas rūpniecības pastiprināta orientācija uz eksportu var dot būtisku ieguldījumu ražošanas potenciāla kāpināšanā un teritoriālā izlīdzināšanā.

Pētījuma mērķis: noskaidrot ražošanas paplašināšanas un eksporta iespējas pārtikas rūpniecībā.

Pētījuma mērķa sasniegšanai tiek risināti sekojoši **uzdevumi**:

1) raksturota pārtikas rūpniecības loma tautsaimniecībā;
2) analizēta pārejas perioda un globalizācijas iespējamā ietekme;
3) prognozēti iespējamie risinājumi uz nozares tālāko attīstību.

Pētījuma **objekts** ir pārtikas rūpniecības potenciāls.

Pētījums balstīts uz monogrāfiskās, sintēzes un analīzes, loģiski – konstruktīvās un statistisko datu analīzes metožu bāzes.

Rezultāti un diskusija
Results and Discussion

Pārtikas rūpniecība, kas Latvijā vienmēr ir bijusi un joprojām ir viens no svarīgākajiem Latvijas tautsaimniecības sektoriem, jau ilgāku laiku atrodas sava veida atdzimšanas stadijā pēc lielā krituma, kāds iestājās pēc neatkarības atgūšanas (1.tabula). Lielākais ražošanas kritums bija vērojams 1995.gadā, kad ražošanas apjoms sastādīja tikai 37,8% no 1990. gada līmeņa.

1.tabula
Table 1

Izmaiņas rūpniecības un lauksaimniecības ražošanas apjomos laika posmā no 1990. līdz 2006.gadam
Changes in the production volume of industry and agriculture during the period 1990-2006 by branches
(%, 1990=100)

Nozares	1995	1997	1998	2000	2001	2002	2003	2006
Visa rūpniecība	38,3	46	47	46,9	51,2	55,5	59,1	66,3
t.sk. iegūstošā	38,8	43	45	58,8	68,6	84,8	89,3	107,7
Pārtikas	37,8	48	47	42,8	45,7	48,0	50,9	59,2
Lauksaimniecība	46,8	44,4	40,6	37,3	39,4	41,0	42,1	45,1
t.sk. augkopība	65,4	74,9	64,2	60,2	58,8	64,7	66,4	74,8
lopkopība	37,8	30,8	29,9	27,0	30,3	30,1	30,9	32,0

Autoru veiktie aprēķini izmantojot: Latvijas Statistikas gadagrāmata. 2007. – Rīga: LR CSP, 2007, 331., 332., 397. lpp.; Latvijas Statistikas gadagrāmata. 2004. – Rīga: LR CSP, 2004, 136., 151. lpp.; Latvijas Statistikas gadagrāmata. 1999. – Rīga: LR CSP, 1999, 188., 213. lpp.

2.tabula
Table 2

Pārtikas rūpniecības īpatsvars pasaulē
The share of food industry in the world
(pa valstu grupām, procentos)
(groups of countries, %)

Nozare	1950	1960	1970	1980	1990	2000
Pasaulē kopumā						
Visa rūpniecība kopā	100,0	100,0	100,0	100,0	100,0	100,0
t.sk. apstrādājošā	69,0	75,4	79,4	80,6	81,5	82,8
pārtikas	15,8	16,5	14,6	13,3	12,8	8,6
Attīstītās valstis						
Visa rūpniecība kopā	100,0	100,0	100,0	100,0	100,0	100,0
t.sk. apstrādājošā	69,4	77,5	82,9	84,3	85,9	86,7
pārtikas	11,8	13,2	11,2	10,9	10,7	7,8
Attīstības valstis						
Visa rūpniecība kopā	100,0	100,0	100,0	100,0	100,0	100,0
t.sk. apstrādājošā	66,9	73,0	72,8	75,3	74,8	69,4
pārtikas	19,2	16,0	15,1	13,0	13,1	11,8

Avots: Фаминский И.П. Мировое хозяйство динамика, структура производства, мировые товарные рынки. - М.: Магистр, 2007, с. 216 – 218.

Šī krituma pamatā bija galvenokārt ražošanas apjoma samazināšanās tā sauktajās primārajās ražošanas nozarēs – augkopībā un lopkopībā. Pakāpeniski un lēnām ar nelielām novirzēm ražošanas apjoms pārtikas rūpniecībā pieauga, un 2006.gadā tas sastādīja 59,2% no 1990.gada līmeņa.

Šobrīd pārtikas rūpniecība ir lielākā Latvijas apstrādājošās rūpniecības nozare. 2006.gadā tā saražoja 25,7% no visas apstrādājošās rūpniecības izlaides apjoma, veidojot tajā 19,7% no pievienotās vērtības, un nodarbināja 21,3% no apstrādājošā rūpniecībā strādājošajiem. Rēķinot pret visu Latvijas rūpniecību, minētie rādītāji sastādīja attiecīgi 22,3%, 15,9% un 19,1%, kas ir augstāki nekā caurmērā pasaulē (skat.2.tabulu).

Pārtikas rūpniecībai pasaulē raksturīgi kopumā stabili, relatīvi augsti ražošanas apjomu izaugsmes tempi kā industriāli attīstītās valstīs, tā attīstības valstīs (Родионова И.А, 2005). Saskaņā ar ANO datiem tās īpatsvars apstrādājošā rūpniecībā pasaules

saimniecībā laika posmā no 1990.-2004.gadam samazinājies no 12,3% uz 10,9% (Ломакин В.К., 2007).

Pārtikas nozarei ir redzama vieta valstu saimniecībā visā pasaulē. Daudzās valstīs tā atrodas otrajā un trešajā vietā starp pārējām rūpniecības nozarēm gan pēc nodarbināto skaita, gan pēc saražotās produkcijas apjoma. Pārtikas produkti tiek ražoti gan vietējām vajadzībām, gan eksportam. Kā redzams no augstākminētā, pie šo valstu kontingenta pamatā pieder arī Latvija.

Iedzīvotāju apgādes nodrošināšana ar pašražotu lauksaimniecības produkciju ir jebkuras valsts pastāvēšanas priekšnoteikums un stabilitātes garants. Tas pat ir politisks jautājums, kā tiek izmantoti savas valsts resursi lauksaimniecības produkcijas ražošanā un pārstrādē.

No 3.tabulas datiem redzams, ka Latvijas mājsaimniecības vidēji uz vienu mājsaimniecības locekli mēnesī 2007.gadā pārtikas iegādei naudā un natūrā kopā izlietoja no 23,7% līdz 38% mājsaimniecības budžeta līdzekļu. Visās sociālekonomiskajās grupās vērtības izteiksmē izdevumi pārtikai svārstījās no 49,37 līdz 53,44 latiem.

Vēršoties plašumā globalizācijai un tirdznieciskajiem sakariem, paplašinās arī eksporta iespējas, nesot līdzi attiecīgas kvantitatīvas un kvalitatīvas izmaiņas, ar kurām katrai valstij jārēķinās, veidojot samērus starp ražošanu un eksportu, kā arī formējot eksporta struktūru atbilstoši iekarotai tirgus nišai.

Latvijā šobrīd apmēram 75% no nozarē saražotā tiek patērēts vietējā tirgū, pārējais tiek eksportēts, galvenokārt uz Igauniju, Lietuvu un Krieviju. Līdz ar iestāšanos Eiropas Savienībā pieprasījums pēc Latvijas pārtikas produktiem palielinājās gan austrumu, gan rietumu virzienā – kā uz Krieviju

3 tabula
Table 3

Patēriņa izdevumu sastāvs un struktūra sociālekonomiskajās grupās vidēji uz vienu mājsaimniecības locekli mēnesī 2007.gadā, latos
Composition and structure of consumption expenses of social economic groups in average per one household member per month, 2007, LVL

Izdevumu struktūra	Algotu darbu strādājošo mājsaimniecības	Pašnodarbināto mājsaimniecības	Pensionāru mājsaimniecības	Citas mājsaimniecības
Pārtika un bezalkoholiskie dzērieni	50,77	53,44	50,88	49,37
Alkoholiskie dzērieni, tabaka	6,21	8,21	3,52	7,13
Apģērbi un apavi	19,44	18,31	7,22	9,19
Mājoklis, ūdens, elektroenerģija, gāze un cits kurināmais	20,61	16,50	22,09	21,89
Mājokļa iekārta, mājturības piederumi un mājas uzkopšana	13,78	11,95	5,93	15,42
Veselība	8,46	7,45	17,64	6,35
Transports	34,47	45,71	6,87	18,01
Sakari	11,19	11,59	5,77	9,70
Atpūta un kultūra	17,32	24,58	7,45	11,52
Izglītība	2,88	2,34	0,53	3,87
Restorāni, kafejnīcas un viesnīcas	13,64	13,63	1,64	7,47
Dažādas preces un pakalpojumi	12,61	12,14	4,48	9,35
Kopā:	**211,38**	**225,84**	**134,02**	**169,27**

Avots: Mājsaimniecību budžetu pētījuma galvenie rezultāti 2007.gadā. LR Centrālā statistikas pārvalde, 2008.-32.lpp.

4.tabula
Table 4

Svarīgāko pārtikas produktu eksports Latvijā 2007.gadā
Exports of the most important food products in Latvia, 2007

	Daudzums		Tūkstošos latu	
	pavisam	% (+,-) pret 2006.g.	pavisam	īpatsvars,%
Lauksaimniecības un pārtikas preces - pavisam	X	X	582482	100
Piens, krējums, citi skābpiena produkti, t	152281	+12,1	52098	8,9
Siers un biezpiens, t	13592	+10,2	28222	4,8
Sviests, t	2840	-12,2	6416	1,1
Svaigas un saldētas zivis, t	51746	+36,2	25852	4,4
Zivju konservi, t	56630	-20,0	47831	8,2
Degvīns, tūkst l alc. 100%	11368	+22,0	24875	4,3
Alus, tūkst. l	13662	-3,6	3699	0,6
Cigaretes, milj. gab.	6750	+3,8 reizes	43003	7,4

Avots: LR Centrālās statistikas pārvaldes dati

5. tabula
Table 5

Svarīgāko pārtikas produktu imports Latvijā 2007.gadā
Imports of the most important food products in Latvia, 2007

	Daudzums		Tūkstošos latu	
	pavisam	% (+,-) pret 2006.g.	pavisam	īpatsvars,%
Lauksaimniecības un pārtikas preces - pavisam	X	X	864628	100
Svaiga, atdzesēta vai saldēta cūkgaļa, t	27162	-2,3	29039	3,4
Atdzesēta vai saldēta mājputnu gaļa, t	28578	-10,2	21480	2,5
Svaigas un saldētas zivis, t	33305	+11,3	36076	4,2
Piens, krējums un citi piena produkti, t	61324	-18,0	38285	4,4
Cukurs, t	28321	+68,8	13368	1,5
Šokolāde un citi produkti ar kakao piedevu, t	9853	-18,0	22149	2,6
Bezalkoholiskie dzērieni ar cukura piedevu, tūkst. l	71253	+16,4	21063	2,4
Dabiskie vīnogu vīni, tūkst. l	22071	-17,9	32852	3,8
Alus, tūkst. l	30344	+36,2	8600	1,0
Cigaretes, milj. gab.	7448	+29,9	53823	6,2

Avots: LR Centrālās statistikas pārvaldes dati

un citām NVS valstīm, tā arī uz ES. Pie tam uz ES valstīm eksports ir palielinājies vairāk nekā pusotras reizes, pateicoties galvenokārt pieprasījumam Igaunijā un Lietuvā. Pārtikas preču eksports uz Igauniju un Lietuvu veido 70% no Latvijas pārtikas preču eksporta uz ES valstīm (Ziņojums par Latvijas tautsaimniecības attīstību, 2008.gada jūnijs).

Svarīgāko pārtikas produktu eksporta struktūra naturālā un vērtības izteiksmē redzama 4.tabulā.

2007.gada sākumā pārtikas produktu ražošanas apjomi turpināja palielināties, bet gada beigās tie būtiski samazinājās kā vietējā, tā ārējā pieprasījuma samazinājuma dēļ. 2008.gada sākumā ražošanas apjomi bija nedaudz zem 2007.gada līmeņa. 2006.

un 2007.gadā strauji palielinājās pārtikas produktu eksporta cenas. Eksportētās produkcijas cenas pieauga mērenākos tempos un sāka nedaudz samazināties. Neraugoties uz straujo produkcijas cenu kāpumu 2006.gadā un 2007.gadā, konkurētspēja mazinājās, jo darbaspēka izmaksas pieauga divas reizes lielākos tempos (Ziņojums par Latvijas tautsaimniecības attīstību, 2008.gada jūnijs).

Būtiski ir noskaidrot arī svarīgāko pārtikas produktu importa struktūru. No 5. tabulas datiem redzams, ka lielos apjomos tiek importēta cūkgaļa, mājputnu gaļa, svaigas un saldētas zivis, piena produkti. Pēc tam, kad Latvija atteicās no cukura ražošanas, valstī pilnībā tiek importēts cukurs.

Domājot par pārtikas rūpniecības turpmāko attīstību un konkrēti par pārtikas produktu eksportu, nebūtu pareizi ignorēt līdzšinējo pieredzi, kurai ir raksturīgas būtiskas neskaidrības. Ir vispār zināms, ka pārtikas rūpniecības ražošanas apjoms Latvijā joprojām tālu atpaliek no 1990.gada līmeņa, taču skaidras atbildes uz to, kāpēc tā ir noticis, nav.

Viens no visai plaši sastopamajiem skaidrojumiem ir tāds, ka sarežģītajā pārejas periodā no plānveida saimniecības uz tirgus ekonomiku Latvijas rūpniecībai pretēji tam, kā tas bija Lietuvā un Igaunijā, esot pietrūcis nepieciešamais atbalsts no valdības puses. Tiek uzskatīts, ka, ja šajā laika posmā Latvijas valdība būtu rīkojusies līdzīgi tam, kā tas tika darīts Lietuvā, Igaunijā un lielākajā daļā Austrumeiropas valstu, tad būtu bijis iespējams saglabāt un atbalstīt lielāku daļu no industrijas, tai skaitā pārtikas tehnoloģijas. Taču Latvijas pirmā prioritāte šajā laikā esot bijusi uzņēmumu privatizācija, bet ne to uzņēmumu atbalstīšana, kuri reāli spēja ražot, izmantojot tās priekšrocības, kādas pavēra eksporta tirgus.

Taču citi uzskata, un viņiem var piekrist, ka, neskatoties uz valdības deklarācijām, pietiekami netika novērtēts no padomju laikiem mantotais industriālais potenciāls, kas bija visai iespaidīgs un vērā ņemams, jo 1991.gadā Latvija bija tā Baltijas valsts, kurai bija visattīstītākā industrija. IKP uz vienu darbinieku Latvijas industrijā bija augstāks nekā pārējās padomju republikās un arī lielākajā daļā Austrumeiropas valstu. Taču līdz pat šodienai nav galīgi noskaidrots, kāda loma šim potenciālam ir bijusi mūsu ekonomikā kopš neatkarības atgūšanas un vai tam varētu būt kāda ietekme Latvijas industrijā un ekonomikas izaugsmē turpmāk. It īpaši svarīgi tas ir sakarā ar 1996.gadā iesākto privatizācijas procesa izraisīto seku pārvarēšanu, jo šis process turpinās vēl aizvien tādā kontekstā, kas saistās ar Latviju kā ES dalībvalsti, un sakarā ar pasaules finanšu un ekonomisko krīzi, kuru mēs izjūtam arī Latvijā. Taču tie ir jautājumi, par kuriem bieži vien nemēdz runāt, bet kurus nevajadzētu arī apiet.

Vissāpīgāk ražošanas sašaurināšanās pārtikas rūpniecībā skāra tieši no Rīgas vairāk attālinātās teritorijas un lauku iedzīvotājus, jo liela daļa pārtikas rūpniecības uzņēmumu, kā, piemēram, piena un gaļas pārstrāde, augļu un dārzeņu pārstrāde un citi, bija izvietoti tieši perifērijā, bieži vien būdami svarīga darba vieta vietējiem iedzīvotājiem.

Tajā pašā laikā turpināja palielināties neizmantotās zemes platības lauksaimniecībā, tai skaitā lauksaimniecībā izmantojamās zemes, kas daudzviet joprojām turpina aizaugt. Jāatzīst, ka padomju gados, veicot lauksaimniecības zemju meliorāciju, tajās tika ieguldītas nozīmīgas investīcijas. Bet ar katru gadu sašaurinoties lauksaimniecības ražošanai, meliorācijas sistēmas daudzviet tika pārtrauktas uzturēt, kā rezultātā tās pārstāja darboties. Līdz ar to Latvijas lauksaimniecība neatgriezeniski zaudēja agrākajos gados nozarē ieguldīto kapitālu. Savukārt, sašaurinoties augkopības produkcijas ražošanai, tas atstāja iespaidu uz lopkopības produkcijas ražošanu.

Domājot par produkcijas ražošanu eksporta vajadzībām, nedrīkst izlaist no redzesloka ražošanas tehnisko un inovatīvo attīstību, kas Latvijā tālu atpaliek no vēlamā, un, kad ir runa par pārtikas rūpniecības uzņēmumiem, tad aina ne tuvu nav iepriecinoša. Tā, piemēram, 2003.gada nogalē valstī darbojās 678 pirmā līmeņa lauksaimniecības produkcijas pārstrādes uzņēmumi, 122 lopkautuves, 175 gaļas pārstrādes uzņēmumi, 66 augļu un dārzeņu pārstrādes uzņēmumi, 124 zivju pārstrādes uzņēmumi. Pārsvarā tie bija relatīvi mazi lauksaimniecības un zivsaimniecības produkcijas pārstrādes uzņēmumi, kas nelielā apjoma dēļ nespēja investēt līdzekļus ES standartu ieviešanā un līdz ar to kļūt konkurētspējīgiem ES tirgū.

Kaut arī pēdējos gados ir sākusies lauksaimniecības produkcijas pārstrādes uzņēmumu koncentrācija un mazo uzņēmumu skaits samazinās, koncentrācija skar galvenokārt lielākās ES prasībām atbilstošās ražotnes. Joprojām daudzviet aprīkojums neļauj ražot ES kvalitātes prasībām atbilstošu produkciju. Ievērojamā daļā pārstrādes uzņēmumu ražošanas iekārtas un tehnoloģijas ir novecojušas, tādēļ to produkcija tikai daļēji atbilst Eiropas Savienības tirgus prasībām un standartiem, kas samazina produkcijas eksporta iespējas. Finanšu trūkums kavē pārstrādes sektora uzņēmumu modernizāciju un attīstību, samazinot konkurētspējīgas produkcijas ražošanu realizācijai iekšējā un ārējā tirgū. Arī nepietiekamais pievienotās vērtības apjoms aizkavē attiecīgo produktu veidu ražošanas tālāku attīstību, bet darbinieku, it īpaši vadošā personāla ierobežotās zināšanas par vadību un tirgzinībām pārtikas produkcijas ražošanā un realizācijā kavē jaunu produktu noieta tirgus atrašanu un ražošanas procesa racionalizāciju. Netiek pilnīgi un pilnvērtīgi izmantots un attīstīts esošais intelektuālais potenciāls konkurētspējas nodrošināšanai nozarē. Vēl

joprojām ir neattīstīta kooperācija un komerciālās saites starp zinātni un izglītības sistēmu, kas spēj piedāvāt nozarē iesaistīto cilvēku resursu attīstību, nodrošināt jaunu produktu un tehnoloģiju attīstību un ieviešanu produkcijas ražošanā un pārstrādē.

Konkurētspējīgas produkcijas ražošana eksportam izjūt un turpmāk aizvien vairāk izjutīs globalizācijas ietekmi. Pirmkārt, globalizācijas apstākļos dažas attīstītās valstis zināmā mērā atslābina uzmanību attiecībā uz tradicionālajām nozarēm, vairāk pievēršoties tādām, kurās tām ir priekšrocības pasaules mērogā (Фаминский И.П., 2007). Šo nozaru īpatsvara samazināšanās ekonomiski attīstīto valstu rūpniecības struktūrā parasti tiek kompensēta ar to paplašināšanos citās valstīs, it īpaši ar vidējo attīstības līmeni (Ломакин В.К., 2007).

Otrkārt, vēršoties plašumā globalizācijai, aktualizējas jautājums par drošību nodrošināšanā ar pārtiku. Tiek uzskatīts, ka to var panākt divos galvenajos veidos:

- tiecoties pēc šī nodrošinājuma ar ražošanu savā valstī;
- sistemātiski maksājot par pārtikas produktu importu.

Daudzas valstis cenšas nodrošināt pašas sevi ar pārtiku, ņemot vērā noteiktu minimumu un rezerves, kas saistās ar neparedzētiem apstākļiem.

Globalizācijas apstākļos veidojas ekonomiskais tīklojums, līdz ar ko lielā mērā mainās ekonomiskā struktūra. Rezultātā tirgi, kas iepriekš ir bijuši pavisam neievērojami, top atvērti nepazīstamiem konkurentiem, par kuriem nekas nav bijis zināms. Ārzemju strādnieki var daudz vieglāk iespiesties reģionālajos tirgos un ienest tajos vērā ņemamas priekšrocības. Tajā pašā laikā daudzkārt aug izdevības un riski. Ir iespējams ražot neskaitāmus produktus gandrīz jebkurā vietā pasaulē, un mobilajiem resursiem tas paver iespēju migrācijai uz ražošanai visdraudzīgāko vidi. Kā sekas koncentrācijas procesiem pasaules mērogā notiek pārvirze par labu lielajiem uzņēmumiem.

Ir maz ticams, ka šīs tendences pavājināsies vai aizies pretējā virzienā. Tādēļ mazie un vidējie uzņēmumi, pie kādiem pieder arī lielākā daļa mūsu valsts pārtikas ražošanas uzņēmumi, ir spiesti attiecīgi reaģēt, ja viņi nevēlas tikt izspiesti no tirgus vai tikt uzpirkti no lielajiem konkurentiem. Uzņēmumiem ir jānāk ar jauniem izaicinājumiem, kur pieder tāda veida ražošana, kas rēķinās ar klientu individualitāti, lai saglabātu konkurētspēju tirgū. Pat tajā gadījumā, kad maza uzņēmuma ģeogrāfiskais rādiuss ir reģionāli šauri ierobežots, tomēr pastāv draudi, ka pašmāju mazajā tirgū var ienākt līdz tam nepazīti konkurenti. Līdz ar to par nepieciešamību kļūst tādas stratēģijas izveide, kas ļauj stāties pretī šiem izaicinājumiem.

Atbilde uz globalizācijas izraisītajām ekonomiskajām izmaiņām ir rodama kooperatīvajos uzņēmumos, veidojot pretspēka pozīciju lieluzņēmumu koncernu struktūrām. Mazie un vidējie uzņēmumi šodien aizvien vairāk atklāj, ka kooperācijas spēja ir globalizācijas spējas priekšnoteikums. Te ir vietā atgādināt, ka Latvijā kooperatīvo uzņēmumu veidošanā ir dziļas saknes. Tā, piemēram, piena rūpniecībā tās bija kooperatīvās pienotavas, ko dibināja piensaimnieku sabiedrības. Pirmā no tām izveidojās 1909.gadā. Līdz pirmajam pasaules karam 1914.gadā Latvijā darbojās jau 88 piensaimnieku sabiedrības. Karš pārtrauca intensīvo piensaimnieku sabiedrību veidošanās procesu, taču, karam beidzoties, tas atsākās no jauna, un 1923.gadā Latvijā darbojās jau 319 piensaimnieku sabiedrības, bet kopā ar privātajām pienotavām pavisam 407 pienotavas.

Šajā kontekstā ir lietderīgi pievērst īpašu uzmanību pārtikas ražošanas uzņēmumu potenciāla attīstībai Latvijas reģionos, akcentējot to piesaisti ārzemju investīcijām, lai iegādātos pasaules standartiem atbilstošas tehnoloģiskās iekārtas. Te ir jāatgādina, ka 2009.gada 27.janvāra un 03.februāra zemnieku vērstie protesti pret valdības nespēju risināt samilzušās problēmas Latvijas lauksaimniecībā, tai skaitā piena ražošanas un pārstrādes nozarē, izbraucot ar lauksaimniecības tehniku uz Latvijas ceļiem, šosejām un bloķējot satiksmi vairākās vietās ap Rīgu un pie Zemkopības ministrijas parādīja, ka zemnieku saimniecību tehniskais apbruņojums ir mūsdienīgs un moderns. Arī nozares potenciāls varētu būt pietiekams, lai Latvijas lauksaimnieki kā līdzīgi ar līdzīgiem varētu konkurēt ar ES veco dalībvalstu lauksaimniekiem. Taču Latvijas politiķu pieļautās kļūdas, iesaistoties sacensībā ar pārējām kandidātvalstīm, par to, kura pirmā noslēgs sarunas par iestāšanos ES, šobrīd nes "augļus". Tāpēc jau vairāku gadu garumā esam spiesti izjust to steigā pieņemto lēmumu sekas, slēdzot tādas sarunu sadaļas, kā "Lauksaimniecība", "Zivsaimniecība" un "Reģionālā politika".

Lai varētu analizēt informāciju par nozares uzņēmumu ražotspēju un noteikt to produkcijas eksporta spējas potenciālu gan valsts mērogā, gan reģionu griezumā, nepietiekama ir statistikas sniegtā informācija par tautsaimniecības nozaru uzņēmumiem. Te der atgādināt, ka kopš 2005. gada LR Centrālā statistikas pārvalde vairs neizdod statistisko datu krājumu "Latvijas reģioni skaitļos". Šo izdevumu ir aizstājis Valsts reģionālās attīstības aģentūras izdevums "Reģionu attīstība Latvijā", kurā informācija tiek vākta un apkopota Latvijas 5 plānošanas reģionu griezumā. Jāatzīmē, ka reģionālās statistikas kārtošana gan par valsti kopumā (NUTS 2 reģions), gan par 6 Latvijas statistiskajiem reģioniem

(NUTS 3 reģioni) ir ES prasība, kuru regulāri apkopo EUROSTAT. Informācija plānošanas reģionu griezumā ir paredzēta Latvijas iekšējo vajadzību apmierināšanai, bet ne ES mērogā notiekošo procesu analīzei. Tas, ka LR Centrālā statistikas pārvalde vairs neizdod šādu statistisko datu krājumu, apgrūtina veikt Latvijas reģionu attīstības tendenču analīzi. Savukārt Valsts reģionālās attīstības aģentūras veidotais izdevums neaptver visus reģionālās statistiskas indikatorus, tāpēc tam ir mazāka informatīvā bāze. Arī "Dienas biznesa" sadarbībā ar LURSOFT veidotais Latvijas lielāko uzņēmumu "TOP 500" ikgadējais izdevums nedod nepieciešamo informāciju par Latvijas reģionos funkcionējošiem uzņēmumiem, investīcijām tajos, tai skaitā ārzemju, to eksportējamās produkcijas/pakalpojumu veidiem u.tml.

Ir vairāki pozitīvi piemēri, kas liecina, ka Latvijas reģionos ir pietiekoši daudz dažāda profila uzņēmumu, kuri ir spējuši piesaistīt ārzemju investīcijas un ražot eksportspējīgus produktus, it īpaši pēc Latvijas iestāšanās ES. Te var minēt uzņēmumus Jelgavā, Daugavpilī, Liepājā, Ventspilī, Valmierā, Aizkrauklē, Brocēnos un citās pilsētās un areālos. Galvenokārt tie ir saistīti ar kokapstrādi, augstu tehnoloģiju un arī pārtikas produktu ražošanu. Te vēl jāpiebilst, ka eksporta spējas nodrošināšana ir bijusi atkarīga no pašu uzņēmēju uzņēmības un zināšanām, personāla kvalitātēm un spējām, Latvijas uzņēmējiem veidojot kontaktus ar ārzemju partneriem, bet mazāk atkarīga no mērķtiecīgas atbalsta politikas no Latvijas valdības puses.

Nedrīkst aizmirst, ka pārtikas rūpniecība pieder pie tām nozarēm, kurās liela nozīme ir tradīcijām un specifikai, ko ir grūti veidot, bet var viegli pazaudēt, ja netiek savlaicīgi pievērsta nepieciešamā uzmanība. Šajā sakarībā īpaši jāatzīmē nesenie notikumi Latvijā, kad savu darbību izbeidza vesela cukura ražošanas nozare, uz iznīkšanas robežas ir nonākusi zivsaimniecības preču ražošana, bet nupat par izdzīvošanu cīnās piena ražošanas un pārstrādes nozarē iesaistītie uzņēmumi.

Neiztur kritiku arī tas, ka pat Valsts atbalsta programma "Atbalsts ieguldījumiem sīko un mazo komersantu attīstībā īpaši atbalstāmajās teritorijās", saskaņā ar Ministru kabineta 2007.gada 20.novembra noteikumiem Nr.798 no atbalstāmo nozaru saraksta izslēdz lauksaimniecības produktu ražošanas un zivsaimniecības nozari. Šīs programmas mērķis, kā norāda tās nosaukums, ir veicināt komercdarbības attīstību īpaši atbalstāmajās teritorijās, tādējādi samazinot nelabvēlīgās atšķirības starp reģioniem un reģionu teritorijām, kā arī sekmējot visas valsts teritorijas līdzsvarotu attīstību. Šajā sakarībā nav attaisnojama Latvijas valdības atsaukšanās uz Eiropas Kopienas dibināšanas līguma I pielikumā minēto lauksaimniecības produktu primāro ražošanu, kā arī produktu, kas atdarina vai aizstāj pienu un piena produktus, kā norādīts Padomes 1987.gada 2.jūlija Regulā (EEK) Nr. 1898/87, kas izslēdz augstāk nosauktās nozares no atbalstāmo nozaru skaita pat īpaši atbalstāmajās teritorijās. Tālajā 1987. gadā pieņemtā ES regula ir diskriminējoša ne tikai vecajām, bet arī jaunajām ES dalībvalstīm. Tāpēc Latvijas pārstāvjiem ES parlamentā ir jāizvērš diskusija atcelt šāda veida diskriminējošas regulas.

Šobrīd, kad notiek ekonomikas lejupslīde globālā mērogā, daļas ražošanas potenciāla pārvietošana no pārsātinātās galvaspilsētas Rīgas uz Latvijas reģioniem var ne tikai kāpināt Latvijas uzņēmēju konkurētspēju pasaules tirgos, bet arī paaugstināt reģionu iedzīvotāju dzīves standartu uz ekonomisko aktivitāšu rēķina dažādos internacionālā biznesa reģionālos klasteros.

Liels ieguldījums būtu politiskās gribas pastiprināšanās, kas laika posmā kopš 1991.gada Latvijas iekšējā politikā vēl joprojām nav pietiekama, kad ir runa par prioritātēm industrijas attīstībā, kaut gan pēc iestāšanās ES tā varētu pavērt valstij iespēju izmantot visas izdevības, kādas dod reģionalizācijas un globalizācijas priekšrocības, un rezultātā paplašināt eksporta zonas Latvijas uzņēmējiem. Neskatoties uz zināmu atpalicību, kāda ir raksturīga Latvijas industrijai, it īpaši kas attiecas uz ražīgumu un tehnoloģiju salīdzinājumā ar citām ES dalībvalstīm, eksporta aktivitāšu attīstība neapstrīdami būs Latvijai izdevīga. Tādējādi tiktu stiprināta reģionalizācijas kā globalizācijas pretmeta iedarbība.

Kopumā augstāk minētais būtu solis uz priekšu Latvijas kā ES dalībvalsts ieguldījums savas sociāli ekonomiskās identitātes stiprināšanā.

Secinājumi, priekšlikumi, ieteikumi
Conclusions and Recommendations

1. Pārtikas rūpniecība ir cieši saistīta ar tradīcijām un sava veida specifiku, ar ko nerēķinoties, var daudz zaudēt.
2. Ražošanas tehniskā un inovatīvā attīstība pārtikas rūpniecībā, kaut arī vēl tālu atpaliek no vēlamā, tomēr ir vērā ņemams komponents Latvijas tautsaimniecībā.
3. Pārtikas rūpniecības produkcijas eksportam Latvijā vienmēr ir bijusi redzama vieta.
4. Liels ieguldījums pārtikas rūpniecības attīstībā varētu būt neatslābstoša politiskā griba attīstīt un sniegt atbalstu nozares produkcijas eksporta veicināšanai.
5. Konkurētspējīgas produkcijas ražošana eksportam izjūt un turpmāk aizvien vairāk izjutīs globalizācijas ietekmi, tāpēc atbilde ir meklējama kooperatīvo uzņēmumu attīstībā.
6. Īpaša uzmanība pārtikas ražošanas uzņēmumu

attīstībai ir pievēršama Latvijas reģionos.

7. LR Centrālai statistikas pārvaldei ir jāatjauno statistisko datu krājuma "Latvijas reģioni skaitļos" izdošana, papildinot to ar informāciju par Latvijas reģionos funkcionējošiem uzņēmumiem, to darbības veidiem atbilstoši saimniecisko darbību statistiskajai klasifikācijai, to eksportējamās produkcijas/pakalpojumu veidiem, investīcijām u.tml..
8. Latvijas pārstāvjiem ES parlamentā ir jārosina diskusija atcelt diskriminējošas regulas, kuras bremzē nacionālo valstu valdībām pašām izlemt, kādas nozares atbalstīt un kādā veidā to darīt īpaši atbalstāmajās teritorijās.

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Application of Experience of the EU Countries in Cooperation of Latvia Dairy Producers

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Abstract
The authors of the paper find out the features of contemporary agricultural cooperation taking into account protection of nature and agricultural interests as well as analyse the current situation and problems in Latvia dairy-farming. The authors consider cooperation system as one of the best solutions to solve problems in Latvia dairy-producing, at the same time applying the experience of other EU countries in the development of cooperation in dairy-farming. The main aim of the paper is to determine potentialities for the use of experience of other EU countries in Latvia dairy producer cooperation system.
Key words: agricultural cooperation, dairy-farming, dairy-producer cooperation.

Introduction
One of the main factors what still inhabits agricultural production in Latvia today, is fragmentised farms system compared with other European Union (EU) member states. The data of the Ministry of Agriculture show that in Latvia a sharp decrease in the number of small farms and increase in the number of farms with utilised agricultural area (UAA) more than 50 ha was observed in 2007 compared with 2005. However, around 65% of all farms in Latvia have less than 10 ha of UAA and their total UAA is only 17% of all UAA. In 2007 small farms (<8 ESU (European Size Unit)) accounted for 95% of all active farms in Latvia (Zemkopības ministrija, 2008).

Such small farms have various disadvantages: weak competitiveness; low level of financial and technical means; dependence on big agricultural production processors; and inability to state own rules to big processors due to insignificant production volume (Špoģis, 1999).

There is a need to draw attention to cooperation to change this situation, and most effectively it can be implemented if we take into account the experience of other countries.

The previous 150 years of cooperation history in the Western countries show that farmers have to be the owners of their production – one of the means to secure profitable production. Cooperatives of farmers control agricultural market in Ireland – 100%; Sweden - 99%; Great Britain – 98%, Denmark – 93%, Finland, Austria and Portuguese – 80%, the Netherlands – 82%, and Germany – 60% (Kalniņš, 2005).

However, in Latvia farmers avoid to speak on the cooperation control of market , as all dairy-processors are under strong business capital pressure, and they state their own rules, and farmers need to adapt to them (Lucāns, 2005).

Three main factors encouraged to study the current situation in dairy-production:
- negative attitude of bigger dairy-processors towards cooperatives, considering them as competitors and just allowing in most cases to collect milk and supply it to the processor;
- currently many farms even big ones with tens and hundreds of diary cows are close to bankruptcy, as purchasing price does not cover production costs;
- state support for dairy producers is not effective.

The aim of the paper is to find out opportunities for Latvia dairy-producers cooperatives using the experience of agricultural cooperatives in the EU countries.

Main tasks:
1) to find out specific features of modern agricultural cooperatives and agricultural interests;
2) to analyse dairy-production and dairy cooperative development trends in Latvia;
3) to analyse the EU member states experience in dairy cooperation development and its potential application in Latvia.

The research object is dairy-producer cooperative opportunities in the EU member states, subject – opportunities for Latvia dairy-producer cooperatives using experience of the EU countries in agricultural cooperatives. Monographic, analysis and synthesis, induction and deduction methods as well as abstract the logical method was used in the study.

The paper is based on the following materials: European Commission regulations, laws of the

Republic of Latvia, regulations of the Cabinet of Ministers regarding agricultural cooperatives, peer-reviewed research and papers, and authors own research data.

Results and Discussion

1. The characteristics of contemporary agricultural cooperation in protection of rural and agricultural interests

Experience of agricultural cooperatives in the EU and other countries shows that:

- cooperatives and their associations on the state level have real opportunities to resist negative processes of economic globalisation, at the same time using all potencies of globalisation effects, including access to needed information, and create mutually profitable partnerships with trustful partners around the world;
- quick adaptation in logistics, so the cooperatives can transport their production to Europe and other parts of the world markets, especially where it is needed most;
- development of cooperation is based on long-term relationships between agricultural producers and cooperatives. Latvian farmers need to learn how to plan production in long-term;
- they limit and help avoid such intercessors and dealers, who form selfish motives and diminish farmers profit;
- ceaseless and purposeful adoption to export markets, creation of new and salable products, widening markets for available products take time and resources; cooperation between entrepreneurs allows to solve these problems successfully, also with effective state support;
- the use of private and public partnership model in cooperatives' activities. During crises, when Latvia does not have resources to master the EU structural funds, to deal heat insulation of buildings etc., government should use classical relieve of the state budget – private and public partnership. The state should guarantee that cooperatives, which have enough resources to involve into private partnership, would have additional advantages in receiving the EU structural and other support.

Processes in 2008 in Latvia again confirmed already known truth that agriculture which consists mainly of individual farmers cannot successfully develop. Farmers' cooperation problem should be solved. Despite that there are factors which complicate dealing with the problem:

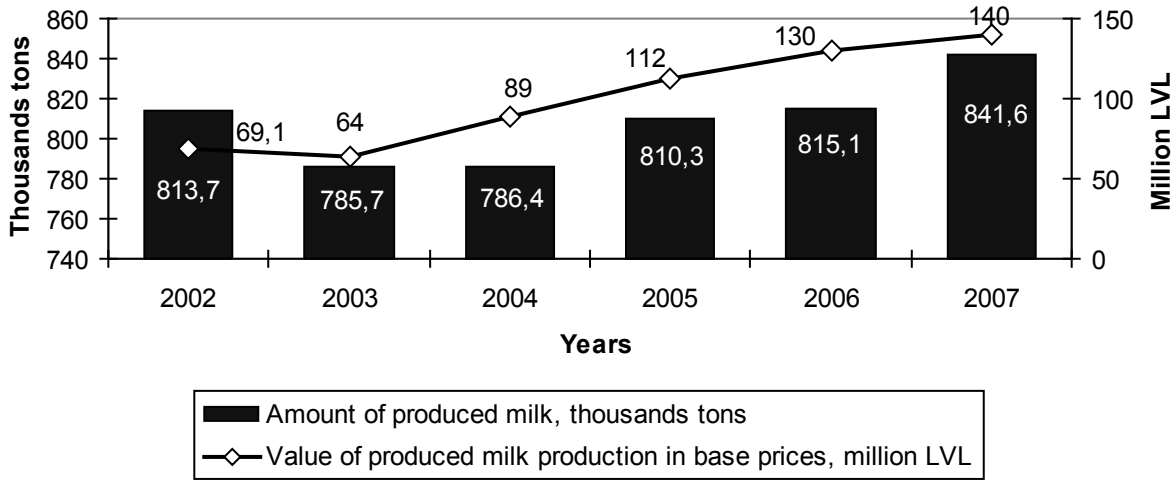
1) typical Latvian farmer everything that is connected with cooperation identifies with collectivism – the system of collective or state farms. Only few know the essence of cooperatives and also know about great success of cooperatives at the end of the 19th and during the 20th century – during the independent state of Latvia;
2) there are farmers, familiarised with success of modern Western cooperatives and their system, who think that taking into account the current situation of Latvia (lack of long-term development programme in the national economy and Latvian farmers tendency for separatism), it is not possible to use experience of cooperatives from other countries;
3) cooperatives vitality also requires quite much of the state support, including not only favourable laws for farmers but also investments in infrastructure development. Just recently the government has drawn attention to these questions.

The experience of the Western countries, including the EU members, shows that the state gains various benefits thanks to agricultural cooperation:

- cooperative takes care of members needs, it leaves positive impact on the society development in general –educational and cultural level of rural inhabitants steadily grows as well as professional knowledge of farmers and workers to do higher and more qualified jobs increases;
- biggest par of the EU members have acknowledged agricultural cooperation's advantages in production development, land elaboration and land erosion diminishing as well as improvement of production quality. Cooperative gives an opportunity to fight against violation of laws and rules, and protects members against arbitrariness regardless who is the initiator of it.

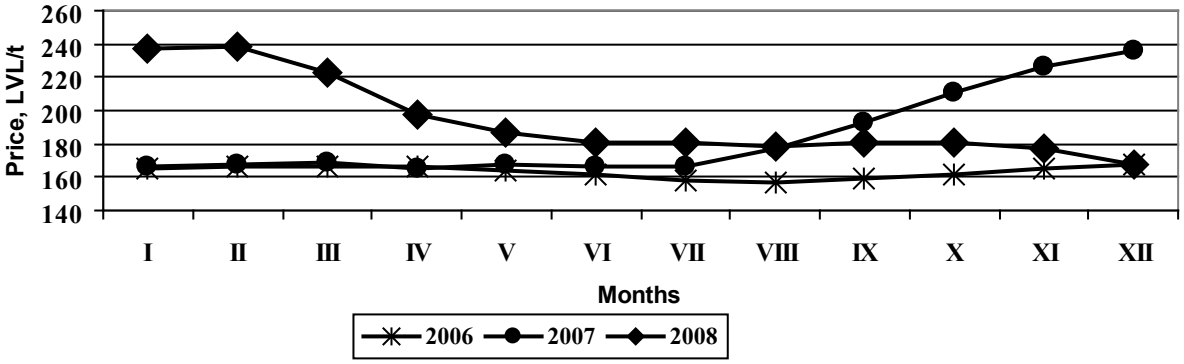
2. The development of dairy-producers cooperation in Latvia and the EU member states

Dairy production is one of the most important agricultural branches in Latvia. In fact dairy production is the only agricultural sector with positive trade balance (in 2007 dairy production export was 327.5 thou. t of milk, while import – 127.6 thou. t of milk) (Zemkopības ministrija, 2008). The data from the Ministry of Agriculture shows that milk made 21% of the total agricultural end product value in base prices and was the second largest product after crops in 2007 (Zemkopības ministrija, 2008). Dairy sector shows its importance and level of development as dairy end products value and total produced milk amount has steadily increased in the past years (Figure 2.1).



Source: made by the authors using the data from the CSB of Latvia and the Ministry of Agriculture

Figure 2.1. **The value of dairy end product at base prices (million LVL) and the amount of produced milk (thousand t) from 2002 to 2007**



Source: made by the authors using the data from the CSB of Latvia and the Ministry of Agriculture

Figure 2.2. **Average purchase price of milk from 2006 to 2008 (LVL / t)**

In 2007 the produced amount of milk has increased by 27.9 thousand t compared with 2002, but if compared with 2006 the produced amount of milk has increased by 26.5 thousand t or 3.4% and 3.25% respectively. At the same period of time milk production base price has grown by LVL 70.9 million and LVL 10 million or 102.6% and 7.7% respectively.

The society more and more speaks about the existing problems in dairy sector despite good production results, and thus it creates threats of instability.

The main problems which prevent the development of dairy sector are as follows:

– despite several years of structural changes in dairy production sector, it is still fragmented. The data of the Ministry of Agriculture shows that in 2007 around 90% of all dairy farms had less than 5 milk cows, including one milk cow in 54.4% of farms. These farms had around 37% of the total number of milk cows. Big farms (more than 100 milk cows) take quite small part in the total structure – 0.4% (Zemkopības Ministrija, 2008)

Greatest weaknesses of small farms are low financial means, completive capacity, e.g., difficulties to get additional financial means, low technical equipment and as a result low productivity, problems to meet all production requirements, and great dependence on big agricultural production processors. Due to their small proportion in total production structure, they cannot demand their own prices and are forced to accept processors dictate (Špoģis, 1999).

– low purchase price of milk (Figure 2.2).

The Central Statistical Bureau of Latvia information shows that a very rapid increase of milk purchase price was seen in the second half of 2007, in December compared with July the purchase price has increased by 42% reaching LVL 236.6 for ton. In 2008 the purchase price slowed down, in December it was LVL 167.04 for ton; it is a 29% decrease in price compared with December, 2007. However, the total amount of purchased milk in November, 2008 compared with October, 2008 has decreased by around 13%; while in December, 2008 compared with November, 2008 it has increased by around 5% (CSB, 2008).

Information available shows that the current milk purchase prices are under production costs level (18.5 santims) and vary between 14 and 16 santims for litre, small dairy producer have even lower purchase price – 10 – 12 santims (Dieziņa, 2008; Lauksaimnieki šogad saskārušies..., 2008). Milk processors predict even lower purchase price of milk from February 1, 2009 if the situation in dairy sector would be catastrophically bad.

– due to the rapid fall of milk purchase price and sharp increase of production resources costs (electric energy, forage, mineral fertilisers etc.) many milk producers cannot cover production costs as well as repay bank credits. The authors dispose information that also medium and bigger dairy producers cannot repay credits and thus they are forced to shut down all production. In April 2008 there were forecasts that the sector would suffer losses of about 25-30% of all dairy producers, only part of them would reorient into crop and beef production etc. (Piena nozarē strādājošie..., 2008; Lauksaimnieki šogad saskārušies..., 2008).

One of the reasons for such problems in dairy sector is related to the law "On Privatisation of Dairy Processors" that came into effect on April 15, 1992. Article 17 of this law refers to the equity capital of privatised company and its calculation, stating that milk producers as well as milk and milk production suppliers have rights to buy no less than 70% of the equity capital of privatised object, employees – no more than 10% of the equity capital, and others - no more than 20%. This provision created a situation that currently all bigger processing companies are under the control of business capital (Lucāns, 2005). Moreover, there exist sharp differences between milk producers' interests and processors interests, it is a background for mutual disagreements and thus slows down dairy sector in general.

Wide dairy producers' cooperation allowing producers to join for new markets, new suppliers and buy processors companies thus reducing production costs etc. could be one of solutions for dairy sector.

According to the information of Agricultural Data Centre in March 2008 there were 34 dairy producers' cooperatives. In 2007 they produced 178 261 050 kg of milk, around 25% of the total milk supplied for processing. It has increased by 19% compared with 2006. Mainly milk produced by cooperatives was supplied by "Piena ceļš" – 26.3%, "Trikāta KS" – 21.8%, and "Dzēse" – 7.5% of all the collected milk (Graudiņš, 2008).

Table 2.1 shows the main performance data of "Piena ceļš", "Trikāta KS" ,and "Dzēse".

According to the information of Agricultural Data Centre the amount of purchased milk in listed associations constitutes more than 50% of the total purchased amount milk in Latvia (Graudiņš, 2008).

Data in Table 2.1 testify that the number of members in all associations has increased in 2008 compared with 2007. It also allows concluding that farmers ever more acknowledge potential benefits of participation in cooperatives. The purchased amount of milk also has grown in all three associations in 2008 compared with 2007. "Dzēse" has an increase of 2441.155 tons, "Trikāta" – around 19323 tons and

Table 2.1

Performance results of activities of cooperatives

Indicators	"Dzēse"		"Trikāta"		"Piena ceļš"	
	2007	2008	2007	2008	2007	2008
Number of members	230 (01.01.2008)	267 (01.01.2009)	221	254	71	111
Amount of purchased milk (t)	12 153.473	14 594.628	60677	~ 80000	46078	62296
Average price of purchased milk, LVL/kg	0.191	0.194	0.220 - 0.230	0.200	0.213	0.211

Source: unpublished data of cooperatives

"Piena ceļš" – 16218 tons. It can be explained with the increase in the number of cooperative members.

The average price of purchased milk in cooperatives is an important indicator: "Dzēse" in 2007 purchased milk from its members for the price of 0.191 LVL/kg, while in 2008 – 0.194 LVL/kg. "Trikāta KS" - 0.220 - 0.230 LVL/kg (2007) and 0.200 LVL/kg (2008) respectively, "Piena ceļš" – 0.213 LVL/kg and 0.211 LVL/kg (unpublished data of "Dzēse", "Trikāta KS", "Piena ceļš").

The average purchased milk price offered by cooperatives in 2008 was essentially higher than the average milk price in Latvia. Cooperatives paid 3-5 santims more than milk processors.

On September 1, 2008 according to the data of Latvia Agricultural Cooperative Association there were 30 agricultural service cooperatives (ASC) in dairy sector in Latvia, thus amounting to 28% of all the ASC. Net turnover in 2007 was LVL 27.065 million. As compared with other branches, the ASC of dairy sector has most farmers – 3389 (end of 2007) or 44% of all ASC involved farmers (LLKA, 2008).

Bigger production and processing companies acknowledged that today as globalisation more and more influences the viability of the national economy the great disadvantage is that Latvia dairy cooperatives are not united.

To improve the situation "Trikata" dairy cooperative invited to create close partnership between cooperatives. This proposal is a good solution in order to create their own milk processing companies, and secure acceptable purchase price for farmers (lujeva, 2008).

What kinds of advantages does consolidation have? "Trikata" project of cooperatives consolidation includes such advantages (in case of successful implementation):

- already in 2009 the production turnover could sharply increase from LVL 20 million to LVL 100 million;
- cooperatives will become the owners of processing companies, profit will be shared between themselves;
- supplied amount of milk to "Trikata" processing company will reach 300 tons per day. Such amount of milk creates good basis,, and secure highest possible purchase prices for farmers;
- supply costs for one milk ton are approximately LVL 15. In case cooperatives consolidate and elaborate effective logistic of milk supply, costs could be reduced to LVL 10, so saving LVL 5 from each ton. During one year it makes LVL 1.5 million if there are supplied 300 thousand tons. It is essential money saving even for a company with turnover around LVL 20 million.
- if farmer is in cooperative, he is sure that milk will be collected in time despite farm location disadvantages. If milk is gathered by combine, then the amount of milk is not important – most important factor will be good location of a farm, otherwise combine will not collect even 10 tons or will set very low purchase price.

The authors of that project were disappointed, because even after several meetings nothing was achieved even an agreement for partnership between dairy cooperatives.

The greatest obstacles for creation of big milk processing company and consolidation of cooperatives are:

- to get credits for production;
- the share of cooperative members in project implementation. Not all members have free financial resources for additional development (lujeva, 2008).

The authors consider absence of dairy cooperative association as the main obstacle to create cooperatives of milk processing companies.

2.1. The experience of other EU countries in dairy producers' cooperation

The experience of Germany and Austria speaks that cooperatives are effective also on very competitive international markets; they are consolidated on regional and international scale as systems of agricultural cooperatives.

Dairy producers have created such systems in Germany. In most cases milk is not sold by dairy cooperatives but dairy regional centres. Due to very remarkable resources, they are successful in wholesale. There is *Deutsches Mich-Kontor* in Hamburg which operates on the national level. Its main task is to export and to import milk production inside and outside the EU. Besides that *Deutsches Milch-Kontor* does intervention in dairy products market, creates and popularises new ones, buys in production facilities and materials for dairy sector (Brazda, Kramer, 2004).

In 1990 all dairy cooperatives of Austria consolidated in Austrian dairy and meat trade cooperatives association - AMF *Austria Milch und Fleischvermarktung.* Consolidated cooperatives became one of the most influential force in food processing and trade. AMF elaborated a programme that helped reduce production costs, and improve logistic of dairy products to all European countries.

Currently AMF broke-up in two autonomous and competing groups – one is located in High Austria, second in Lower Austria. However it is not an obstacle for continual export raise to other EU countries (Brazda, Kramer, 2004).

Important experience is shown by Denmark dairy cooperatives, which could be useful also for dairy cooperatives members in Latvia. There all milk is collected by cooperative dairy plant or society, and stored in cold storage. Cooperative regularly checks each farms:

- milk quality;
- level of fat and protein in milk.

The price of milk depends on these two factors. Central laboratories make tests, and they are independent. Specialization is one of the features in Denmark and other EU countries modern dairy sector. Cooperatives usually separate production in several production units, so that each units size is economically regardless what they produce – butter, cheese, condensed milk etc. Whey is bought by milk producers and used for feed.

Dairy federation represents both private and cooperative sector, it is involved in all available branches, to improve production results (Dānijas fermeru organizācijas un kooperatīvi, 1991).

Dairy cooperatives in Latvia can learn some practical aspects also from Lithuanians. There essential help is received from the State Support fund. In Lithuania dairy cooperatives have infrastructure of milk pre-processing in their possession (Ramanauskas, 2004).

During pre-processing process frapped, conserved production advantages are clearly seen: increase of available market territory; products become easily transportable and stored; increase in the demand of products and their price as they have more qualitative packing and sanitary norms (Ramanauskas, 2004).

Taking into account the above mentioned practice of cooperatives of the EU countries, we can make several conclusions for the improvement of Latvia's cooperatives performance:

- to maintain the existing level of milk amount in production. The state with financial instruments, tax allowances, and elaborating laws should be able to protect dairy sector, because it is an important sector in Latvia, it produces irreplaceable food necessary for the whole nation;
- we should be aware of the nation's century long established food structure, in which milk and milk production have high proportion;
- dairy cooperatives' combine as well as private milk processing companies should seriously take into account these things:
  - the quantity of any products depends on protein and fat level in milk, which should be considered by calculation of prime costs in processing (Vītola, 2007);
  - it is important to determine raw milk amount, namely, proportion of milk and skimmed milk in each product after processing. If raw milk proportion is big and purchase prices lowers, then relatively little investments are needed in the equity capital, salaries etc. (Ramanauskas, 2004).

Those cooperatives which are successful in producing of new products should use any opportunities to create production lines of specific products with high value added, for which a niche could also be found on local and international markets.

It would be necessary to create two or three independent milk quality laboratories available for all dairy farmers in each region.

Conclusions

1. Accumulated agricultural experience of the EU countries shows that on free market conditions farmers can withstand only by joining forces and material resources in cooperatives.
2. Agricultural cooperatives and their associations in the EU countries have proved their viability in cyclic development of free market economics, when during crises a rapid decrease is observed in the purchase prices of agricultural products, bank loans accessibility and massive bankruptcy waves of individual milk producers.
3. The main preconditions of cooperatives viability are the ability of cooperatives and their associations to mobilise resources to produce, process and sell their production, to offer services without agents for their member and individual farmers, giving opportunity to lower production costs and increase profit.
4. Fragmented farm system, low milk purchase price, and inability cover production costs are the main dairy problems in Latvia.
5. Latvia dairy producers, who currently are in very critical situation under pressure on the one hand of the world financial and economic crisis and on the other hand big milk processors dictate, need to learn experience from the EU cooperatives and creative use it, to stabilise the existing ones, and to create new cooperatives.
6. The data of "Piena ceļš", "Trikāta KS" and "Dzēse" show that there is a tendency of increase in the number of members and purchased milk amount, besides the average milk price in 2008 was higher than the average purchased milk price in Latvia.
7. The experience of German and Austria dairy (also meat producers) cooperatives prove that in today's hard competition environment only those cooperatives are successful, which are associated

on national and regional level as agricultural cooperative associations.

8. Dairy producers in Latvia should follow the experience of Denmark and other EU countries, and create their own milk processing facilities to soften down big milk combines dictate. The next step would be creating own shops and strong credit-savings banks, thus to compensate competition inadequacies on milk market.

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Kopsavilkums

Šajā rakstā tiek noskaidrotas mūsdienu lauksaimniecības kooperācijas īpatnības lauku un lauksaimniecības interešu aizstāvēšanai, analizēta pašreizējā situācija un galvenās problēmas piensaimniecības nozarē Latvijā (zema iepirkuma cena, sadrumstalota ražošana, piensaimnieku nespēja nosegt piena ražošanas pašizmaksu un atmaksāt kredītus). Kā vienu no labākajiem risinājumiem situācijas uzlabošanai autori iesaka kooperatīvo sabiedrību veidošanu, ņemot vērā citu ES valstu (Vācija, Austrija, Dānija, Lietuva) pieredzi kooperācijas attīstīšanā piensaimniecībā. Raksta mērķis ir noteikt ES valstu lauksaimniecības kooperācijas uzkrātās pieredzes izmatošanas iespējas Latvijas piena ražotāju kooperācijas attīstībā. Mērķa sasniegšanai izvirzītie uzdevumi: izzināt mūsdienu lauksaimniecības kooperācijas īpatnības un lauku un lauksaimniecības interešu aizstāvēšanā, izpētīt piena ražošanas un piensaimniecības kooperācijas attīstības tendences Latvijā, izpētīt ES valstu pieredzi par piensaimniecības kooperācijas attīstības iespēju izmantošanu Latvijā.
Atslēgas vārdi: lauksaimniecības kooperācija, piensaimniecība, piena ražotāju kooperācija

Krūmmelleņu audzēšanas pieredze pasaulē un tās attīstības ekonomiskais pamatojums Latvijas lauksaimniecībā
Highbush Blueberry Growing Experience in the World and Economic Justification for its Development in Latvian Agriculture

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Jānis Reševskis, Mg.oec.

Abstract
One of the best examples of non-traditional industries in Latvia is highbush blueberry growing. The highbush blueberry industry is a new industry even in the context of the world; it has spread over the world from the North America, and in the United States of America this agricultural crop has become the second most important one after strawberries. The USA is the biggest producer of highbush blueberries. The proportion of output of highbush blueberries produced in the South America is sharply increasing in the world's total output of this product. There are good perspectives for producing highbush blueberries in Latvia. Growing highbush blueberries in Latvia is economically efficient on certain conditions of soil quality and owing to the availability of watering equipment.
Key words: highbush blueberries, cultivation, economic efficiency.

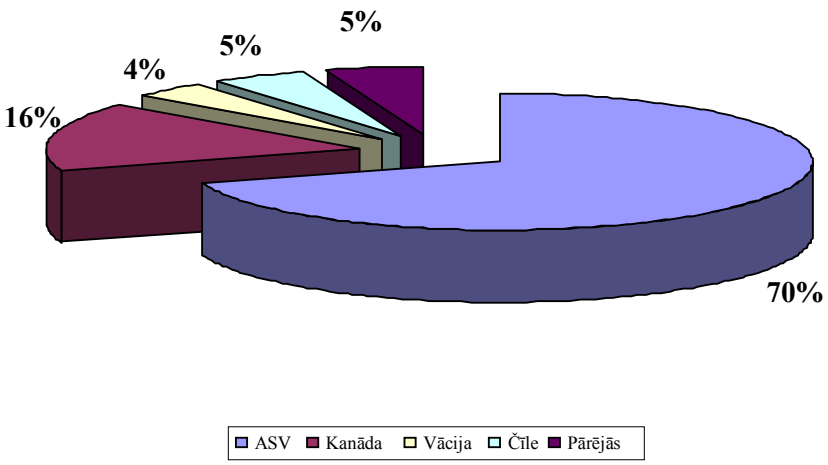
Ievads
Introduction

Mūsdienās krūmmelleņu vadošās valstis ir ASV un Kanāda, kur atrodas 75% no visas pasaules krūmmelleņu laukiem, kas kopā saražo apmēram 86% no pasaulē saražotās krūmmelleņu produkcijas. ASV joprojām ir lielākais šīs kultūras ražotājs apgādājot vairāk kā pusi no visas pasaules saražotās krūmmelleņu produkcijas. 2003. gadā Latīņamerikas valstīs atradās 11% no pasaules krūmmelleņu stādījumiem, no kuriem vairāk par pusi jeb 65% atradās Čīlē (Importation of fresh...,2007).

Pasaulē par šo kultūru kopumā zināms tomēr samērā maz, jo krūmmellenes ir selektīvi radītas ASV un pirmie izplatīšanas mēģinājumi dažādās pasaules vietās bieži vien ir bijuši neveiksmīgi. Līdz ar to pašlaik to valstu skaits, kur nopietni nodarbojas ar šīs kultūras attīstīšanu un komerciālu audzēšanu ir samērā neliels. Ziemeļamerikas kontinentā lielākās ir ASV un Kanāda (1.att.), nelieli mēģinājumi ar to nodarboties ir arī Meksikā, bet tās devums gan Ziemeļamerikas, gan pasaules kopējā saražotās produkcijas apjomā ir līdzvērtīgs nullei. Strauji attīstās šīs kultūras audzēšanas popularitāte Latīņamerikas valstīs Čīlē un Argentīnā. Āfrikas kontinentā par nopietnu ražotājvalsti mēģina veidoties Dienvidāfrikas Republika. Eiropā lielākās ir Vācija un Polija. Vēl pasaules skatījumā var izcelt Austrāliju, Jaunzēlandi un Japānu. Dažās valstīs kā Ķīnā, Brazīlijā, Urugvajā un Taizemē komerciālā krūmmelleņu ražošana vēl ir tikai eksperimentālā stadijā un veiksmes gadījumā nopietnākus ražas pieaugumus var gaidīt tikai nākotnē (Importation of fresh ..., 007).

Latvijas lauksaimnieki arvien vairāk pievēršas dažādu Latvijai netradicionālu lauksaimniecības nozaru attīstīšanā. Viens no šādu netradicionālo nozaru spilgtākajiem piemēriem ir Latvijai samērā jaunas kultūras – krūmmelleņu audzēšana. Krūmmelleņu nozare ir jauna nozare arī pasaules kontekstā, no Ziemeļamerikas tā lēnām ir izplatījusies pa visu pasauli un Amerikas Savienotajās valstīs, kura ir lielākā lauksaimniecības produkcijas ražotāja un patērētāja pasaulē, šī kultūra ir kļuvusi par otru nozīmīgāko pēc zemenēm. (Industrial & Institutional, b.g.). Jautājums vai pie mums šī nozare attīstīsies tikpat sekmīgi, kā piemēram, strauju krūmmelleņu industrijas attīstību piedzīvojusī Čīle, paliek atklāts, tomēr perspektīvas Latvijai ir labas un no tā, vai Latvijas lauksaimnieki tās pratīs izmantot,arī atkarīga šīs nozares nākotne Latvijā.

Informācija par melleņu pielietošanu uzturā un ārstniecībā atrodama jau gadsimtiem senā vēsturē Ķīnā, Krievijā un Centrāleiropā. Tā Eiropā 16. gadsimtā dziednieks Kalpeppers atklāja, ka mellenes labvēlīgi iedarbojas uz aknām un kuņģi, ir savelkošs līdzeklis, palīdz hroniska klepus un plaušu slimību ārstēšanā. Tāpat sen zināms, ka mellenes ievērojami uzlabo redzi tumsā, pastiprina asumu un novērš acu nogurumu. Ir pierādīts, ka mellenes paātrina acs tīklenes atjaunošanos. (Ak, šīs vērtīgās ...,b.g.)



Avots: autoru veidots pēc World Bluberry datiem
Source: developed by the authors according to data of the World Blueberry

1.att. **Krūmmelleņu ražas kopapjoma īpatsvara sadalījums pasaulē, 2003.g.**
Fig.1. **Total output of highbush blueberries structure by countries in 2003, %**

Mellenes satur vienu no retāk ogās sastopamām organiskām skābēm – dzintarskābi, kas nodrošina asinsvadu sieniņu elastību. Mellenes lieliski pasargā asinsvadus, novērš eritrocītu „salipšanu", aizsargā organismu no asiņu sabiezēšanas – no insulta un infarkta. Mellenēs ir daudz cinka un kālija. Cinks uzlabo asinsrites procesus, regulē ogļhidrātu apmaiņas procesus. Cinka trūkuma gadījumos tiek traucēti augšanas procesi. Kālijs nepieciešams kaulu skeleta attīstībai, zobu veidošanās procesam, nervu un muskuļu sistēmas normālai darbībai. Pektīni, savukārt, neitralizē toksīnus, nodrošina baktericīdo un pretiekaisuma iedarbību. (Ak, šīs vērtīgās ...,b.g.)

Mellenes satur daudz karotīna, kas uzlabo redzi. Tāpēc mellenes uzskata par vienu no labākajiem līdzekļiem pret kataraktu. Tās tiek izmantotas medicīnā, jo to sastāvā ir daudz flavonīdu, kas ir 20 reižu aktīvāki nekā C vitamīns un tiem nav nekādu nevēlamu toksisku iedarbību. Flavonīdi nostiprina arī acs muskuļu un saistaudu aparātu, pasargā nervu šūnas no nevēlamiem kairinājumiem un efektīvi neitralizē hroniskus iekaisumus, tai skaitā mazina Pārkinsona slimības risku. (Veselīgs uzturs...,b.g.)

Šīs ogas bagātas arī ar anticianīdiem – spēcīgiem dabiskiem antioksidantiem. Mellenes spēj palielināt smadzenēs dofimīna daudzumu, kas regulē svarīgus procesus smadzeņu darbībā, kā rezultātā labāk notiek arī visi apmaiņas procesi organismā. Šī viela smadzenēs veicina normālu augšanas hormona veidošanos, kurš atbild par šūnu atjaunošanos visā organismā.

Mellenes uzlabo nervu impulsu novadīšanu no nervu šūnām uz citiem orgāniem. Jālieto, ja ir asinsvadu slimības, varikozo vēnu paplašinājumi (īpaši grūtniecības laikā), acs tīklenes nerva iekaisumi. Mellenes nostiprina saistaudus, vēnu un kapilāru sieniņas.

Melleņu sula ir vērtīga gan kā pārtikas sastāvdaļa, gan kā krāsviela. Melleņu sula ir C, B1, B2, PP vitamīnu, karotīna, tanīna, pektīna, minerālvielu – īpaši magnija un dzelzs , kā arī organisko skābju avots. (Ak, šīs vērtīgās ..., b.g.)

Pētījumu hipotēze ir: krūmmelleņu kultūras audzēšana ir ekonomiski izdevīgs darbības virziens.

Darba mērķis: izvērtēt krūmmelleņu nozares attīstību pasaulē un dot priekšlikumus šīs nozares attīstībai Latvijā.

Darba uzdevumi:

1. izpētīt krūmmelleņu kultūras attīstības iespējas Latvijā pasaules valstu kontekstā.
2. ekonomiski izanalizēt krūmmelleņu kultūras attīstību Latvijā.

Materiāli un metodes: Darbā tika izmantoti krūmmelleņu audzētāju sniegtā informācija gan periodiskajos izdevumos, gan interneta resursos, gan vadošo augkopības speciālistu monogrāfijās.

Darbā pielietotas šādas pētījumu metodes: monogrāfiskā; loģiski-konstruktīvā; grafiskā; statistikas; analīzes-sintēzes; SVID analīze.

1. Ražošanas attīstība Ziemeļamerikā
1. Output development in the North America

Krūmmellene ir viena no dažām ogām, kuras dzimtene ir Ziemeļamerika. Kultivēšanas rezultātā radītā oga tika piemērota vietējai augsnei un komerciāli attīstīta Amerikas ziemeļaustrumu daļā un Kanādas

dienvidu provincēs. Rezultātā mūsdienās tieši šīs abas valstis ir vadošās krūmmelleņu ražotājvalstis pasaulē. Ziemeļamerikā un pasaulē kopumā pārsvarā tiek attīstītas divu tipu krūmmelleņu sugas tā saucamās augstās krūmmellenes (highbush) un zemās krūmmellenes (lowbush). Augstās krūmmellenes tiek audzētas 35 ASV štatos un divās Kanādas provincēs, kamēr zemās krūmmellenes, galvenokārt, tikai Kanādas austrumu daļā un Mainas štatā ASV. (North American Highbush...,2006) Kopējā krūmmelleņu produkcijas apjomā pasaulē augsto krūmmelleņu devums ir apmēram 70% un attiecīgi 30% sastāda zemās krūmmellenes. Kopējais Ziemeļamerikā saražoto augsto krūmmelleņu produkcijas apjoms pēdējo 40 gadu laikā ir strauji pieaudzis. No 4300 tonnām 1965. gadā līdz pat 137153 tonnām 2005.gadā. (North American Highbush...,2006) Tāpat pēdējo gadu laikā strauji palielinās augsto krūmmelleņu platības apjomi. Tā no 1995.gada līdz 2005.gadam to apjomi palielinājušies par 49% (2.att.dati).

ASV ražotājiem pēdējo 20 gadu laikā ir izdevies gandrīz dubultot no viena hektāra iegūstamo ražu salīdzinājumā ar Kanādas audzētāju panākto ražības pieaugumu, pieaugusi ir ASV kā vadoša krūmmelleņu ražotājvalsts loma pasaules tirgū (Fruit and Tree ..., 2003).

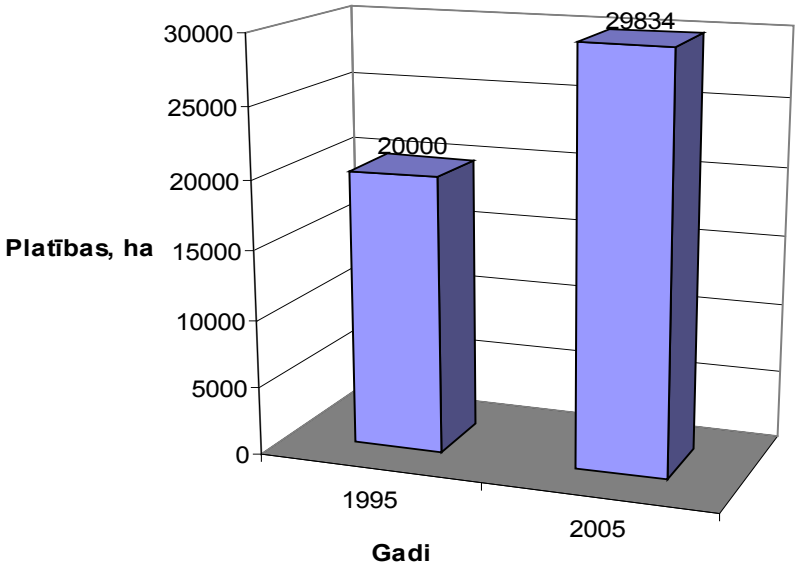
Apskatot atsevišķi augsto krūmmelleņu situāciju ASV, no 35 ASV štatiem, kur tās tiek audzētas, deviņu štatu saražotā augsto krūmmelleņu produkcija nodrošina 98% no kopējā valstī saražotā apjoma. No štatiem Mičiganas štats ir vadošais saldētu krūmmelleņu ražotājs un Ņūdžersija, savukārt vadošais svaigas krūmmelleņu produkcijas ražotājs ASV.

2005. gadā ASV saražoja 135 021 tonnas 381 milj. USD apmērā. ASV krūmmellenes tiek novāktas laika posmā no aprīļa līdz oktobra sākumam ar ražas maksimumu no jūnija vidus līdz augusta vidum.

Laika posmā no 1995.-2005.gadam, kopējais ASV patēriņš pieaudzis par 47% no 0,364 kg līdz 0,56 kg uz vienu cilvēku gadā. Lielākā daļa no patēriņa pieauguma ir uz svaigas produkcijas patēriņa pieauguma rēķina, kas būtībā pēdējo desmit gadu laikā ir dubultojies.

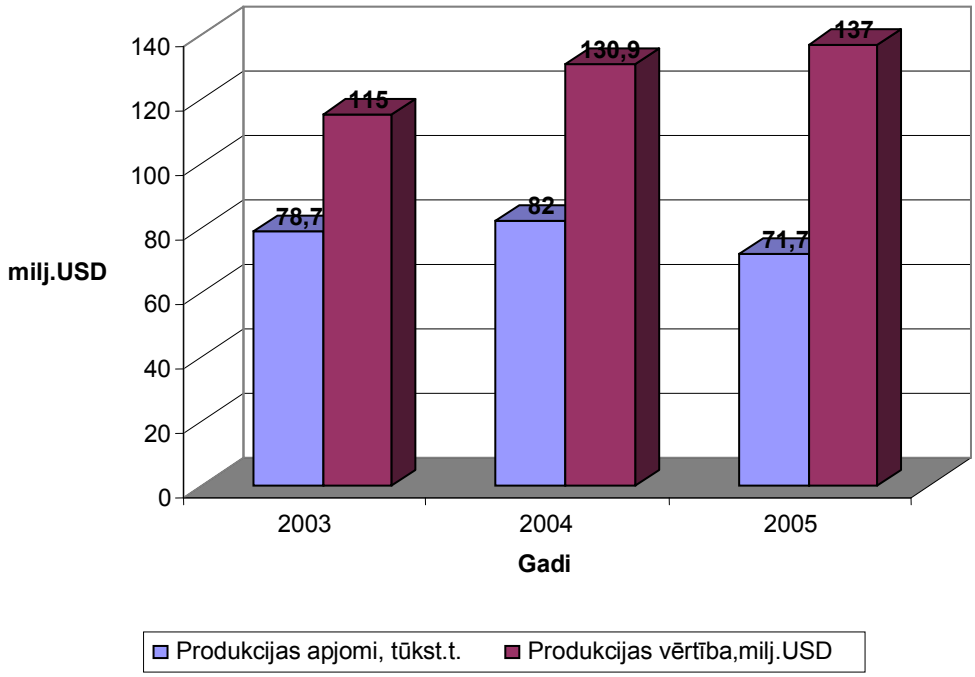
Kanāda. Kanāda ir pasaulē vadošā zemo krūmmelleņu ražotājvalsts. 2005. gadā tā saražoja 45448 tonnas zemo krūmmelleņu ogas, kuru vērtība bija gandrīz 65 milj. UDS un 26234 tonnas augstās krūmmellenes ar kopējo vērtību 73 milj. USD. Kopumā 2005. gadā Kanāda saražoja 704000 tonnas augļu produkcijas, kuru vērtība bija 552 milj. USD. Eksportam saražota produkcija 399 milj. USD vērtībā.

Galvenā Kanādas krūmmelleņu ražotāja ir Britu Kolumbija. Tā ir viena no desmit Kanādas provincēm un tajā tiek saražoti 97% no visas Kanādas augsto krūmmelleņu produkcijas. Nelielos apmēros augsto krūmmelleņu audzēšana notiek arī Ontario, Kvebekas un Nova Skotijas provincēs (Crop Profile for ...,2007). Zemo krūmmelleņu audzēšanā Kanādā tik izteikta vadošā ražotāja nav, šajā jomā trīs provinces kopā



Avots/source: North American...,2006.

2.att. **Augsto krūmmelleņu platību salīdzinājums 1995. un 2005.g. Ziemeļamerikā,ha**
Fig.2. **Highbush blueberry plantations in the North America in 2005 as compared to 1995, ha**



Avots/source: Developments in Berry...,2003.

3.att. **Britu Kolumbijā saražotās produkcijas apjomi, tūkst. t un tās vērtība 2003.-2005.g., milj.USD**
Fig.3. **Quantities of blueberries produced in British Columbia in 2003-2005, thousand t and million USD**

Britu Kolumbija, Kvebeka un Nova Skotijas province saražo aptuveni 86% no visa valsts kopapjoma.

Britu Kolumbija ir trešā lielākā krūmmelleņu ražotāja pasaulē aiz Mičiganas un Ņūdžersijas štatiem ASV.

No eksporta tirgiem visnozīmīgākais ir ASV tirgus, kurš patērē apmēram 86% no visas Kanādas eksportam domātās augsto krūmmelleņu produkcijas, ar apmēram 13% tai seko Japāna. Pārdošanas apjomi uz citiem tirgiem kā Eiropas Savienības valstīm, Austrāliju un Ķīnu ir bijuši daudz mazāki.

Kā redzams pēc 3.attēla datiem saražotās produkcijas apjomi 2003. un 2004. gadā bijuši līdzīgi un 2005. gada kritumu varētu izskaidrot ar nelabvēlīgiem laika apstākļiem. Tajā pat laikā produkcijas vērtība ir pakāpeniski pieaugusi un 2005. gadā tās vērtība ir pat lielāka kā iepriekšējos gados. Produkcijas vērtības pieaugums skaidrojams ar vispārēju pieprasījuma pieaugumu pēc krūmmelleņu produkcijas, kas līdzi sev nes arī cenas pieaugumu.

2. Ražošanas attīstība Dienvidamerikā
2. Output development in the South America

Kultivētās krūmmelleņu šķirnes Dienvidamerikas kontinentā tika ieviestas pagājušā gadsimta 80-tajos gados, kad tika novērtēts šīs jaunās kultūras potenciāls un attīstības iespējas šajā reģionā. Mūsdienās vadošās šī reģiona krūmmelleņu ražotājvalstis ir Čīle un Argentīna, pēdējos gados ir pievienojušās arī Brazīlija un Urugvaja, tomēr to platības vēl ir salīdzinoši mazas. Tā Brazīlijai 2004. gadā skaitījās lauki 25 ha platībās, bet Urugvaja savukārt ziņoja par 100 ha svaigi apstādītām platībām (Blueberry Production in ..., bg).

Dienvidamerikas kontinenta valstīm ir milzīgas priekšrocības starp pārējām pasaules ražotājvalstīm. Tām ir atbilstoša augsne, klimatiskie apstākļi, pieņemamas darbaspēka izmaksas un zemas zemes cenas. Tāpat milzīgas priekšrocības tām ir arī kā tā saucamajām ne sezonas ražotājām, jo šīs valstis atrodas zemeslodes dienvidu puslodē, ražas sezona tām iestājas laikā, kad ziemeļu puslodē atrodošajās valstī ražas sezona ir beigusies. Lai gan Dienvidu puslodē ir vēl vairākas nopietnas ražotājvalstis, kā Jaunzēlande, Austrālija un Dienvidāfrikas Republika, tikai Dienvidamerikas kontinenta valstīm nelielā attāluma dēļ ir manāmas priekšrocības starp pārējām. Tās atrodas salīdzinoši netālu no galvenajiem noieta tirgiem un šis faktors tirdzniecībā, un it īpaši svaigu ogu tirdzniecībā ir ļoti būtisks (1.tabulas dati).

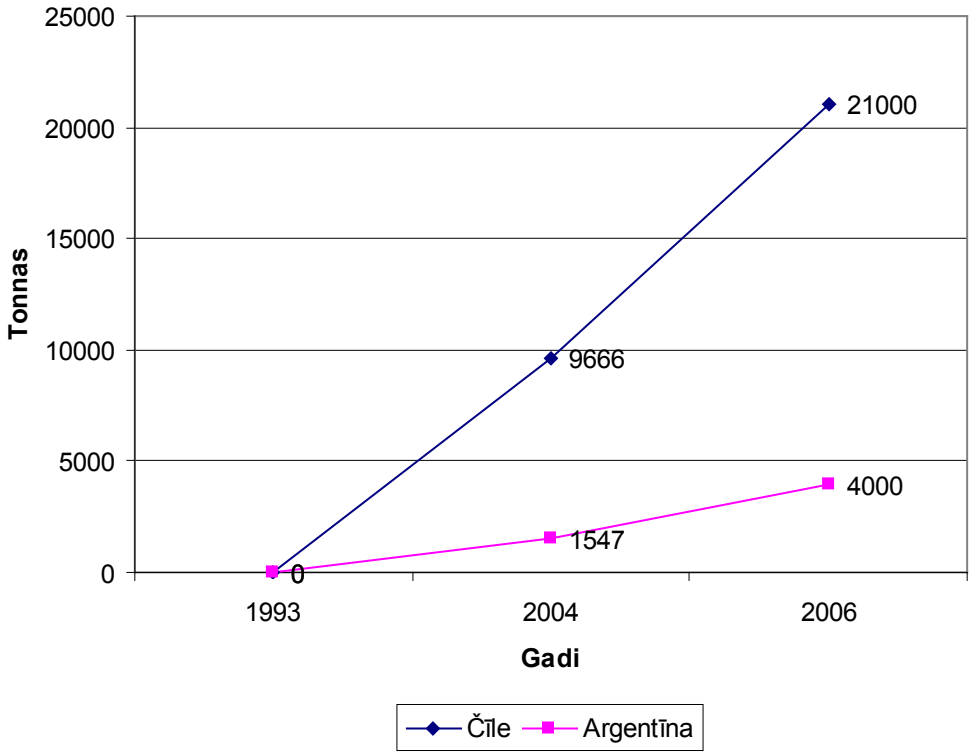
Čīle. Ogu ražošana Čīlē ir jauna industrija, kas strauji attīstās. Pēdējo 10 gadu laikā ogu eksporta

1.tabula/Table 1

Krūmmelleņu platību apjomi Dienvidamerikas valstīs no 1987.-2006.g., ha
Highbush blueberry plantations in the South American countries in 1987-2006, ha

Valsts/Country	**1997**	**1993**	**1998**	**2003**	**2006**
Čīle/Chile	10	580	1280	2470	5200
Argentīna/Argentine	0	7	35	1180	3400
Urugvaja/Uruguay	-	-	-	8	500
Brazīlija/Brazil	-	-	-	24	80
Kopā/Total	**10**	**587**	**1315**	**3682**	**9180**

Avots/source: Blueberry Production...,b.g.



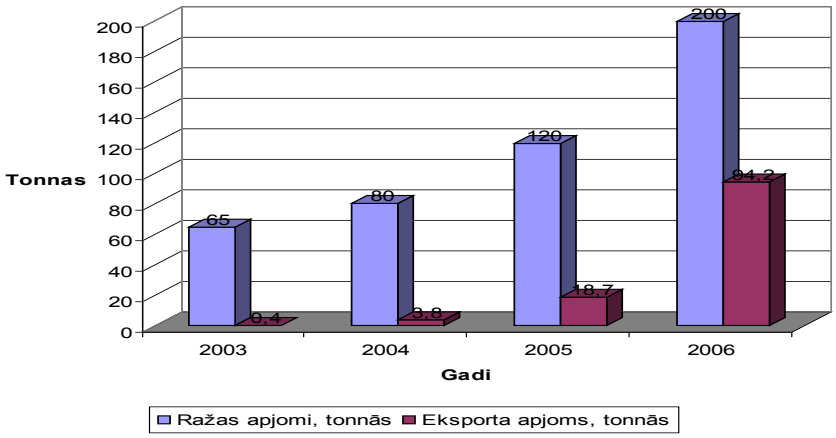
Avots/source: Blueberry Production...,b.g.

4.att. **Krūmmelleņu ražas apjomu pieaugumus Čīlē un Argentīnā, 1993.-2006.g., t**
Fig.4. **Increase in output of highbush blueberries in Chile and Argentine in 1993-2006, t**

apjomi te trīskārtojušies. Turklāt tieši pēdējos gados attīstība ir visstraujākā – apjomi pieaug par 21% gadā. Vairākums saldēto ogu tiek eksportētas uz ASV (40%) un ES (34%). Svaigas ogas, galvenokārt, nonāk ASV tirgū, kur krūmmellenes ir īpaši pieprasītas (Ogu industrija Čīlē...,2007).

Pēc 4.attēla datiem var secināt, ka krūmmelleņu ražas apjomi 2006. gadā Čīlē ir pieckārt lielāki kā Argentīnā un ņemot vērā 2. tabulas datus par platībām šajās abās valstīs, var izdarīt secinājumus, ka lielais Čīles pārsvars ražas apjomu ziņā varētu būt dēļ Argentīnas salīdzinoši jaunajiem stādījumiem, kas vēl nav sākuši dot savas pilnās ražas.

Urugvaja. Pēc pēdējiem datiem 2007.gadā Urugvajā bija ap 600 ha lieli krūmmelleņu stādījumi (Outlooks for blueberry...,2008). Krūmmelleņu lauki izvietoti pamatā astoņos Urugvajas departamentos: Salto,Paisandū, Kolonijā, Sanhosē, Kanelones, Maldonado, Lavalejas un Rochas. Lielākā daļa ap 70% no šajos laukos iestādītajiem stādiņiem ir laboratoriski pavairoti un nāk no laboratorijām Argentīnā un Urugvajā. Pārējie 30% ir tradicionāli



Avots/source: Importation of Blueberries...,2007.

5.att. **Urugvajas ražas un eksporta apjomi laika posmā no 2003.-2006.g.,t**
Fig.5. **Uruguayan output and export quantities during 2003-2006, t**

pavairoti un ievesti no ASV stādu audzētavām. Ražas tiek iegūtas no oktobra beigām līdz pat decembra sākumam.

Urugvajas krūmmelleņu audzētāji savu produkcijas noietu ir atraduši ASV, kur šajā laika periodā ir svaigu krūmmelleņu produkcijas deficīts un kurš Urugvajas audzētājiem tiek uzskatīts par primāro savas produkcijas noieta tirgu (Importation of Plants ...,2007). Paralēli tiek rasti arī citi noieta tirgi un nākošie būtiskākie ir ES valstu tirgi. Tā 2003. gadā 353 kg ar gaisa transportu tika eksportēti uz Beļģiju. Gadu vēlāk jau uz ES valstīm Beļģiju, Vāciju, Spāniju, Franciju un Itāliju eksportēti 2675 kg krūmmellenes.

5.attēla dati parāda Urugvajas krūmmelleņu ražas un eksporta apjomu pieaugumu. Tā ražas apjomi 3 gadu laikā no 2003.-2006. gadam pieauguši par 31%, bet eksporta apjomu pieaugums ir lielāks un sasniedz 235%.

3. Ražošanas attīstība Austrālijā un Jaunzēlandē
3. Output development in Australia and New Zealand

Austrālija. Deivids Džons (David Jones) 70.gados no ASV ieveda dažādas krūmmelleņu šķirnes un mēģināja veikt selekcijas darbu, lai izveidotu Austrālijas klimatam piemērotākas šķirnes viņam šajā selekcijas darbā pievienojās vēl viens selekcionārs Ridijs Bells (Ridley Bell). Rezultātā šo abu selekcionāru pūliņi izrādījās veiksmīgi un jau 70-to gadu vidū ar viņu abu pūlēm tika nodibināta Ausytrālijas Krūmmelleņu audzētāju asociācija (Australian Blueberry Growers Association) jeb saīsinājumā ABGA, kura mūsdienās apvieno 100 audzētājus no visas valsts (Blueberry,b.g.).

Pašlaik Austrālijas krūmmelleņu industrija ir nonākusi līdz fāzei, kad sākas pakāpenisks audzētāju konsolidācijas process, kurā šie audzētāji apvienojās kooperatīvos un cita veida organizācijās.

Produkcijas ražošana pārsvarā ir koncentrēta Austrālijas austrumu piekrastē Viktorijas un Jaundienvidvelsas štatos, mazākos apjomos arī Kvīnslendas, Tasmānijas, Dienvidaustrālijas un Rietumaustrālijas štatos. Austrālijas krūmmelleņu audzētāju asociācijas ABGA biedri saražo 95% no kopražas un trīs lielākie krūmmelleņu ražotāji saražo apmēram 70% no visas Austrālijas produkcijas kopražas.

2004.gada sezonā Austrālijas kopējās krūmmelleņu apjoms bija 2400 tonnas 22 milj. USD apmērā. Apmēram 50% no ogu produkcijas tiek patērēti vietējā tirgū, 30% tiek eksportēti uz Eiropas un Āzijas tirgiem, atlikušie 20% tiek pārstrādāti, pārsvarā saldētā produkcijā. Klimatisko īpatnību dēļ Austrālijā svaigu ogu ražas ir iespējams iegūt visu cauru gadu, ar ražas maksimumiem periodā no oktobra līdz martam. 2004. gadā cenas vietējā tirgū kļuva augstākas kā eksporta tirgos un vietējie ražotāji un eksportētāji nolēma diversificēties un sadalīt tirgus – eksporta tirgus, vietējais tirgus un pārstrādātās produkcijas tirgus. Šādu soli tie spēra, lai mazinātu iespējamus pieprasījuma riskus nākotnē (Australian Blueberry Industry...,2005). Zināmu daļu krūmmelleņu produkcijas, lai papildinātu vietējo pieprasījumu, Austrālija importē no Jaunzēlandes. Eksporta tirgos ļoti nozīmīgs konkurents ir Čīles un Argentīnas ražotāji. Šajā valstī darbaspēka izmaksas ir ievērojami zemākas kā Austrālijā un līdz ar to viņi spēj pārdot produkciju par zemākām cenām (Bluberry Industry Development..., 2008).

2.tabula/Table 2

Austrālijas un Jaunzēlandes krūmmelleņu ražas apjomi 2003.g.,t
Output of highbush blueberries in Australia and New Zealand in 2003, t

Valsts/Country	Platība,ha Area, ha	Svaigas,t Fresh, t	Pārstrādei,t Processed, t	Kopā,t Total, t
Austrālija/Australia	504	1651	350	2001
Jaunzēlande/New Zealand	395	296	600	896
Kopā	**899**	**1947**	**951**	**2898**

Avots/source: World Blueberry...,b.g.

3.tabula/Table 3

Jaunzēlandes ogu industrijas statistika 2004.-2006.g., ha
Statistics of the berry industry in New Zealand in 2004-2006, ha

	Platības,ha Area, ha			Audzētāju skaits Number of growers		
Ogas/Berries	2004, ha	2005,ha	2006,ha	2004	2005	2006
Upenes/Black currants	1450	1450	1450	50	48	52
Krūmmellenes Highbush blueberries	-	-	420	-	-	95
Avenes/Raspberries	225	220	200	60	60	60
Zemenes/Strawberries	220	175	170	120	98	100

Avots/source: Export Berryfruit...,b.g.

Pēc 2. tabulas datiem redzams, ka 2003. gadā Austrālijas krūmmelleņu platību apjomi bija par aptuveni ¼ daļu lielāki, bet ražas apjomi tajā pat laikā lielāki par 123% kā Jaunzēlandē.

Galvenie krūmmelleņu audzētāju apgabali atrodas valsts dienvidaustrumu daļā Jaundienvidvelsas un Vikrorijas štatos.

Jaunzēlande. Jaunzēlandei šī ir samērā jauna kultūra, komerciāla šīs kultūras ražošana notiek kopš pagājušā gadsimta 80-tajiem gadiem. Krūmmelleņu industriju Jaunzēlandē pārstāv vietējo audzētāju dibināta asociācija Blueberries New Zealand Inc. (BBNZ). Tās loma ir visas krūmmelleņu industrijā iesaistīto audzētāju interešu aizstāvība, krūmmelleņu produkcijas popularizēšana Jaunzēlandē un noieta tirgus meklēšana. Pašlaik asociācijā ir apvienojušies 95 krūmmelleņu audzētāji un 16 ogu eksporta kompānijas, kas kopumā apsaimnieko vairāk kā 400 ha.

Jaunzēlandes ražotājiem ir attāluma un izmaksas priekšrocības par Čīles ražotājiem produkcijas piegādēs uz Austrālijas un Āzijas tirgiem.

Krūmmelleņu platību pieaugums Jaunzēlandē (3. tab.dati) nav sevišķi straujš, ja ņem vērā ka pagājušā gadsimta 90-to gadu sākumā bija ap 300 ha un uz 2006. gadu tika rēķināti lauku apjomi tikai 420 ha, tad pieaugums vairāk kā desmit gados ir vien 29%, kas salīdzinoši ar šīs kultūras pieauguma rādītājiem citās valstīs ir ļoti niecīgs.

4.Ražošanas attīstība Eiropā
4. Output development in Europe

Pirmās krūmmelleņu platības Eiropā parādījās Nīderlandē 1920-tajos gados. No turienes tās jau tālāk izplatījās vispirms uz Poliju un Itāliju, un tālāk jau pa pārējo Eiropas daļu.

Mūsdienās viena no vadošām Eiropas valstīm krūmmelleņu ražošanā un patēriņā ir Vācija, kurai ražošanas apjoms strauji tuvojas Polijai (Gough R.E.,u.c.,1995).

2004. gadā Polijas audzētāji saražoja 3,7 tūkst. tonnas, lielākā daļa tika realizēta svaigas produkcijas tirgū. Augsto krūmmelleņu ražas sezona Centrāleiropā ir samērā īsa, tā ilgst no jūlija vidus līdz septembra vidum. Krūmmelleņu realizācija saldētas produkcijas veidā pagarinātu krūmmelleņu produkcijas pieejamības periodu patērētājiem. (The changes of...,2007)

Pēc krūmmelleņu platības uz šodienu Polijas audzētāju jau apsteidz Vāciju un ir lielākie krūmmelleņu ražotāji Eiropā. Ja 2004. gadā Polijas un Vācijas audzētāju krūmmelleņu platības vēl bija līdzīgas ap 1500 ha, tad ar katru nākamo gadu Polijas audzētāji arvien pārliecinošāk palielināja platību

apjomus, kamēr Vācijas audzētāji savas platības palielināja samērā nelielos apjomos.

Ražas apjomi 2004. gadā bija par labu Vācijas audzētājiem, kuri novāca 8000 tonnas, kamēr Polijas audzētāji tikai 3750 tonnas, tas gan izskaidrojams ar to, ka Polijas audzētāji savas platības palielināja strauji un tikai pēdējos gadus, līdz ar to viņu krūmmelleņu stādījumi vēl bija jauni un īstās ražas nedeva.

Cenas vietējā Polijas tirgū ir salīdzinoši augstas priekš vietējā patērētāja, līdz ar to lielākā daļa no krūmmelleņu produkcijas tiek novirzītas uz Rietumeiropas tirgiem.

Krūmmelleņu audzētājus Polijā apvieno Polijas krūmmelleņu audzētāju asociācija (PBGA), kura dibināta jau 1995.gadā, un kurā iestājušies ap 40 biedriem. (Polish Blueberry acreage...,2007)

5.Ražošanas attīstība Āzijā
5. Output development in Asia

No Āzijas valstīm divas lielākās ražotājvalstis ir Japāna un Ķīna. Lai gan pasaules mērogā ne viena, ne otra, ar saviem saražotās produkcijas apjomiem nav starp līderiem, tad starp Āzijas valstīm šīs divas būtībā ir vienīgās, kuru audzētāji nodarbojas ar tādu lietu kā krūmmelleņu ražošanu. No abām tieši Japāna ir tā, kura saražo kaut nedaudz vērā ņemamus apjomus pasaules kontekstā.

Pēc prognozēm nākamajiem desmit gadiem Japānā ir plānots paplašināt krūmmelleņu stādījumus līdz 1000 ha un iegūstamās ražas apjomus palielināt no 3000 – 4000 tonnām. Kopējās krūmmelleņu pieprasījums, prognozēts, ka palielināsies līdz 30000 tonnām gadā (Blueberry Production in...,b.g.).

Pēc 4.tabulas datiem var spriest par Āzijas valstu ražotāju salīdzinoši mazajiem apjomiem pasaules mērogā. Japānai iestādīto krūmmelleņu apjomi katrā periodā pakāpeniski ir palielinājušies, turpretim Ķīnas audzētājiem pēdējā 2003. gadā platību apjomi ir pat samazinājušies.

Šajā 5.tabulā esošie dati parāda Japānas un Ķīnas saražoto krūmmelleņu attiecību 2003. gadā. Kā redzams, Japānas krūmmelleņu audzētāju saražotais ir daudzkārt lielāks kā Ķīnas audzētāju iespētais.

6.Ražošanas attīstība Āfrikā
6. Output development in Africa

Krūmmelleņu audzētājus Āfrikas kontinentā pārstāv daži audzētāji Dienvidāfrikas Republikā. Kopējā pasaules kontekstā šīs zemes audzētāji ieņem vien statista lomu, tomēr pēdējos gados arvien aktīvāk tiek palielinātas jauno stādījumu platības, kas savas ražas dos tik pēc pāris gadiem, tāpēc ar pārliecību var sacīt, ka nākotnē šīs zemes audzētāji arvien noteiktāk sāks ieņemt savu vietu starp vadošajiem pasaules krūmmelleņu ražotājiem. Pēc pēdējiem datiem 2003. gadā Dienvidāfrikā bija krūmmelleņi lauki 346 ha apjomā, kas deva kopējo ražu 300 kg apjomā (Blueberry Production...b.g.). Pēc šiem datiem var secināt, ka nozare Dienvidāfrikā vēl ir jauna, būtībā sākusies ap 2000.gadu. Ražu apjomiem pieaugot jau tagad citās ražotājvalstīs, kā Austrālijā un Jaunzēlandē, uztraucās, ka Dienvidāfrikas audzētāji ar savām potenciāli augstajām ražām varētu sākt konkurēt

4.tabula/Table 4

Krūmmelleņu platību izmaiņas Āzijas valstīs, 1980.-2003.g., ha
Changes in highbush blueberry plantations in Asian countries in 1980-2003, ha

Valsts/Country	1980	1998	2001	2003
Japāna/Japan	10	220	220	346
Ķīna/China	0	0	97	49
Kopā/Total	**10**	**220**	**317**	**395**

Avots/source: World Blueberry...,b.g.

5.tabula/Table 5

Japānas un Ķīnas krūmmelleņu ražas apjomi 2003.g., t
Output of highbush blueberries produced by Japan and China in 2003, t

Valsts/Country	Platība,ha Area, ha	Svaigas,t Fresh, t	Pārstrādei, t Processed, t	Kopā, t Total, t
Japāna/Japan	346	400	600	1000
Ķīna/China	49	14	0	14
Kopā/Total	**395**	**414**	**600**	**1014**

Avots/source: World Blueberry...,b.g.

par noieta tirgiem, galvenokārt jau Eiropā. Eiropas valstu tirgos sava salīdzinoši mazā attāluma un līdz ar to arī transportēšanas izdevumu dēļ Dienvidāfrikas audzētāji iegūst būtiskas priekšrocības.

7.Krūmmelleņu kultūras pirmsākumi Latvijā
7. Origins of highbush blueberries in Latvia

Pēc Latvijas augļkopju asociācijas datiem Latvijā krūmmellenes tiek audzētas 220 hektāru platībā. Skatoties uz kopējo augļu koku un ogulāju kopējo stādījumu platību, kas ir 13,7 tūkst. hektāru, tas gan ir diezgan neliels skaitlis. Tomēr tajā pat laikā ir jāņem vērā vairāki momenti. Pirmkārt, krūmmellenes Latvijai ir salīdzinoši jauna kultūra. Ņemot vērā dažus eksperimentālus audzēšanas gadījumus, tā nopietnāk Latvijā ar to nodarbojas tikai aptuveni 10 gadus. Otrkārt, diezgan svarīgs ir izmaksu jautājums. Salīdzinoši ar citu gan tradicionālu, gan netradicionālu kultūru audzēšanu, krūmmelleņu audzēšanas izmaksas ir lielākas diezgan ievērojami.

Pētot lauku platību īpatsvaru Latvijas rajonos, var secināt, ka skaidri izceļas trīs Latvijas rajoni. Pirmais ar 34% no kopējās krūmmelleņu platības ir Jelgavas rajons. Tas izskaidrojams tikai ar vienas saimniecības lielo īpatsvaru kopējā Latvijas krūmmelleņu platību apjomā, jo Jelgavas rajonā šī saimniecība ir vienīgā, kas nodarbojās ar krūmmelleņu audzēšanu. Tā ir SIA „Arosa", kura viena apsaimnieko 53,6 hektārus, kas ir nedaudz vairāk kā trešā daļa no visas Latvijas kopējiem apjomiem.

Otrs rajons šajā Latvijas griezumā, kura krūmmelleņu platības sastāda 26% no kopējā Latvijas krūmmelleņu apjoma ir Alūksnes rajons. Alūksnes rajona gadījumā šis procentuāli lielais apjoms ir pamatots, jo šajā rajonā atrodas piecas saimniecības, kuru vienīgais vai viens no nodarbošanās veidiem ir krūmmelleņu audzēšana. Divas lielākās šī rajona saimniecības SIA „Lienama-Alūksne" laukus 22,6 ha platībā. Otra lielākā ir SIA „G.A.S.", kas apsaimnieko krūmmelleņu platības 8,8 hektāru platībā Mālupes pagasta Ķikšu purvā.

Ja skatās pēc saimniecību skaita, desmit Latvijas rajonos ir pa vienai saimniecībai, trīs ir rajoni, kuros ir divas saimniecības un tikai divi ir tādi, kuros ir vairāk kā divas saimniecības, tie ir jau pieminētais Alūksnes rajons ar veselām piecām saimniecībām un Rīgas rajons, kurā ir četras saimniecības. Tā kopējais Rīgas rajona saimniecību krūmmelleņu platību apjoms ir 8,6 hektāri, kas ir vidēji 2,15 hektāri uz saimniecību. Rīgas rajonā neviena saimniecība krūmmelleņu platību ziņā neizceļas starp pārējām, lielākā ir zemnieku saimniecība „Jaunpelši" ar apsaimniekotiem 5,4 hektāriem, kamēr otra lielākā ar 2 hektāriem krūmmelleņu lauku ir zemnieku saimniecība „Brasliņi". Abām pārējām saimniecībām krūmmelleņu lauku lielums nav lielāks par hektāru, vienai ir 0,4 hektāri un otrai 0,8 hektāri.

Tiešā pārdošana, kas Latvijā vēl nav tik izplatīta kā vecajās Eiropas valstīs un ASV, sevī iekļauj vairākus produkcijas pārdošanas veidus: uz vietas saimniecībā, tirdzniecības vietu veidošana ceļmalās, Pick-Your-Own (PYO) jeb lasi pats.

8.Krūmmelleņu audzēšanas SVID analīze
8. SWOT analysis for growing highbush blueberries

Stiprās puses

- Iekļauta Augļkopības nozares attīstības koncepcijā kā perspektīva nozare ar visu tam paredzamo valsts atbalstu;
- Atbalsts integrētai krūmmelleņu audzēšanai uz 2008.gadu ir 252 Ls/ha;
- Atbalsta lielums stādījumu ierīkošanai 2008. gadā ir 2530 Ls uz 1 ha (ja ir vismaz 2000 stādu uz 1 ha);
- Labs noieta tirgus gan Latvijā gan ES. Vietējā tirgus piesātinājums svaigām ogām tiek prognozēts tikai uz 2017.gadu, līdz ar to patlaban ir iespēja ieņemt savu tirgus daļu;
- Svaigu ogu tirgum piesātinoties var pāriet uz šo ogu pārstrādi līdz ar to iegūstot produkcijas ar augstāku pievienoto vērtību;
- Krūmmelleņu audzēšana nodrošina salīdzinoši vieni no augstākajām ienākumu un peļņas masas attiecībām no vienas platības vienības kā citas kultūras;
- Latvijā audzētie ogas aromāta, bioloģiski aktīvo vielu, kā arī veselīguma ziņā pārspēj dienvidos audzētos;
- Vietējā tirgū, sevišķi lielveikalos, trūkst vietējo ogu, iespējams to eksports uz tuvējām ziemeļu un ziemeļaustrumu valstīm. Produktu tirdzniecības priekšrocības. Krievija ir liels tirgus bez valodas barjeras;
- Dodot lielu peļņas masu no ha, krūmmelleņu audzēšana ļauj sekmīgi finansiāli pastāvēt pie salīdzinoši nelielām platībām;
- Dārzu kopšana, kur daudz roku darba, rada jaunas darba vietas laukos;
- Stādījumi ir daudzgadīgi, nav jāatjauno katru gadu.

Vājās puses

- Nepieciešami lieli kapitālieguldījumi dārzu stādīšanai, glabātavu celtniecībai, tehnikas iegādei, kā arī līdzekļi to kopšanai līdz pilnai ražai;

- Kultūra nav pietiekami izpētīta Latvijas apstākļos;
- Produkcijas salīdzinoši augstā cena vietējā tirgū var mazināt pieprasījumu;
- Krūmmellenes vietējā tirgū ir salīdzinoši maz zināma kultūra;
- Dārzu kopšana prasa augstas kvalifikācijas darbaspēku, bet ražas vākšanai, kā arī kopšanai ir sezonas raksturs;
- Nepietiekams kvalitatīvas produkcijas apjoms, neizveidota kooperācijas un realizācijas sistēma var apgrūtināt nostiprināties tirgū.

Iespējas (labumi)

- Saimniecības īpašniekam projekta sekmīgs iznākums nodrošinātu iespēju nodarboties ar peļņu nesošu lauksaimniecības nozari un nodrošinātu finansiālu nodrošinātu dzīvi laukos;
- Pie sekmīgas projekta realizācijas vasaras sezonās ražas novākšanā tiks piesaistīts vietējais darbaspēks. Būs vajadzīgi vismaz 3-5 cilvēki, kuriem tiks nodrošināts darbs pie ogu novākšanas ar konkurētspējīgu atalgojumu;
- Ar valsts atbalstu integrētai augļu audzēšanai nodrošināt saimniecības straujāku attīstību;
- Audzējot platības, ar augstāku kopšanas mehanizāciju, var panākt zemāku pašizmaksu un lielāku peļņu, kā arī samazināt darbaspēka pieejamības problēmas risku;
- Krūmmellenes Latvijā pircēju vidū tiek iepazītas arvien plašāk, tas, savukārt, veicina pieprasījuma apjoma palielināšanos;
- Plašas produkcijas realizācijas iespējas ārpus Latvijas.

Draudi

- Nelabvēlīgi laika apstākļi, piemēram, agri uznākušas salnas vai silts rudens ar pēkšņām salnām var nosaldēt stādu dzinumus;
- Nepietiekamu zināšanu trūkums var veicināt kļūdu rašanos, kas savukārt, attiecīgi ietekmētu stādījumu vai ražas kvalitāti;
- Dzīvnieki var apgrauzt krūmmelleņu krūmus;
- Ja attīstība nebūs pietiekami strauja un kvalitatīva, tirgū nostabilizēsies konkurenti;
- Ja netiks nodrošināts valsts atbalsts integrētai augļu audzēšanai vismaz 5 gadus, samazināsies personīgie brīvie līdzekļi un attīstības iespējas;
- Ja turpināsies cilvēku aizplūšana no laukiem, dārzu kopšanas un ražas novākšanas darbi tiks nokavēti vai veikti nekvalitatīvi;
- Nozares attīstība var tikt apdraudēta pie nepietiekama valsts un privāta sektora atbalsta zinātniskiem pētījumiem, jaunu audzēšanas, uzglabāšanas un pārstrādes tehnoloģiju apguvē un selekcijā;
- Ja netiks pielietotas modernas, zinātniski pamatotas tehnoloģijas, dārzs būs mazražīgs un produkcija nekvalitatīva, nekonkurētspējīga;
- Katra kļūda var ietekmēt ne tikai viena, bet daudzu gadu ražu, līdz ar to samazinot ienākumus.

Avots: autoru pētījums.

9.Krūmmelleņu projekta finanšu analīze
9. Financial analysis of the highbush blueberry project

Aprēķinātās izmaksas ir sastādītas izmantojot dažādus pieņēmumus:

- Izvēlētais lauks ar augsni, kas ir vidēji laba, respektīvi, skābuma līmenis ir intervālā no pH 4,5-5,5, bet kvalitātes uzlabošanai tomēr nepieciešama vagu pildīšana ar kūdru.
- Kā apūdeņošanas sistēma izvēlēta pilienveida laistīšanas iekārtas, kuras nodrošina nepieciešamo ūdens padeves mehānismu un ir lētākas kā smidzināšanas apūdeņošanas sistēma, tomēr tajā pat laikā šajā variantā riska moments, kas ir saistīts ar salnām un to radīto bojājumu stādiem, saglabājas.
- Tiek pieņemts, ka ūdens avots dīķa veidā atrodas blakus laukam.
- Visi tehnisko darbu pakalpojumi, kā aršana, kultivēšana, vagu dzīšana u.c. tiek pirkti, līdz ar to šajās izmaksās netiek iekļautas tehnikas un ar to saistīto agregātu iepirkumu izmaksas. Šāds lēmums ir attaisnojams gadījumā, kad ierīkojamās un apsaimniekojamās krūmmelleņu platības ir relatīvi nelielas, respektīvi, viens līdz divi hektāri. Gadījumos, kad ierīkojamās platības ir lielākas, vēlama ir savas tehnikas iegāde, kas, lai gan palielina izdevumu tāmi, tomēr, samazina atkarību un nodrošina pilnvērtīgu saimniecības darbu.
- Ja platību apjomi prasa tehnikas iegādi, tad vēl ir jārēķinās ar sekojošām pozīcijām.
  - Traktors ar jaudu 30 – 40 Zs – 7000 Ls
  - Uzkarināmais miglotājs, 12 m darba platums, ietilpība 1000 L-400 Ls
  - Zema traktora piekabe ražas transportam – 3000 Ls
  - Zāles pļāvējs – zaru smalcinātājs – 700 Ls

Kopējās nepieciešamās tehnikas iegādes izmaksas sastāda 11 000 Ls.

Darbu un materiālu izmaksas vienam hektāram ir pieņemtas nosacītas un katrā atsevišķā gadījumā var variēt atkarībā no augsnes kvalitātes, ūdens resursu, tehnisko pakalpojumu un darbaspēka pieejamības.

6. tabulas dati parāda sagaidāmos ražas apjomus četros dažādos laukos ar atšķirīgiem augsnes un apūdeņošanas nosacījumiem. Pirmajos divos pastāvēšanas gados ražas nav sagaidāmas, savas pirmās ražas krūmi sāk dot trešajā gadā. Šo ražu apjomi

6. tabula/Table 6

Krūmmelleņu ražošanas apjomi atšķirīgos tehnoloģiskajos laukos, kg/ha
Output of highbush blueberries in different technological fields, kg/ha

Ražošanas gads Year of production	**Krūmmelleņu kultūrai atbilstoša augsne**		**Krūmmelleņu kultūrai neatbilstoša augsne**	
	Soil suitable for highbush blueberries		Soil unsuitable for highbush blueberries	
	Ar apūdeņošanas sistēmu With irrigation system	Bez apūdeņošanas sistēmu Without irrigation system	Ar apūdeņošanas sistēmu With irrigation system	Bez apūdeņošanas sistēmu Without irrigation system
1	-	-	-	-
2	-	-	-	-
3	600	450	450	225
4	2000	1500	1500	1000
5	4000	3000	3000	2000
6	5500	4000	4000	2500
7	7000	4500	5000	3000
8	8000	5000	6000	3000
9	8000	5000	6000	2500
10	8000	5000	6000	2500
11	7000	4000	5000	2000
12	7000	4000	5000	2000
13	7000	4000	5000	1500
14	6000	3500	4000	1500
15	6000	3500	4000	1000
16	6000	3500	4000	-
17	5000	3000	3500	-
18	5000	3000	3500	-
19	5000	3000	3500	-
20	4000	2500	3000	-

Avots: autoru veidots pēc Safley Ch.D. datiem, 2005.
Source: developed by the authors according to Safley Ch.D. data, 2005

ir atkarīgi no augsnes kvalitātes un apūdeņošanas sistēmas esamības. Pilnbriedu un attiecīgi ražas maksimumus gandrīz visi lauki iegūst sākot ar astoto gadu, izņēmums ir ceturtais lauks ar vissliktākajiem nosacījumiem krūmmelleņu audzēšanai, tas savu ražas maksimumu iegūst par gadu ātrāk kā pārējos laukos, jau septītajā gadā. Pārējos laukos, tajā skaitā laukā ar vislabvēlīgākajiem nosacījumiem, kur augsnes kvalitātes nosacījumi ir atbilstoši šīs kultūras prasībām un kurā ir ierīkota apūdeņošanas sistēma ražas maksimālo daudzumu iegūst periodā no astotā līdz desmitajam gadam. Šajos gados no šī lauka tiek iegūts ap 8 tonnām no hektāra jeb par 3 tonnām vairāk kā tiek iegūts no augsnes kvalitātes ziņā līdzīga lauka tikai bez apūdeņošanas sistēmas. Ražas daudzums šajā periodā no lauka ar krūmmellenēm piemērotu augsni, bet ar laistīšanas iekārtu ir 6 tonnas, kas ir divreiz lielāks kā šādā laukā bez laistīšanas iekārtas. Pēc 6. tabulas datiem redzams arī krūmmelleņu pastāvēšanas ilgums laukā ar vissliktākajiem nosacījumiem krūmmellenēm tiek rēķināts tikai 15 gadu, kamēr pārējos laukos ar labākiem nosacījumiem tas ir vismaz par 25% lielāks.

Pēc ražas maksimuma gadiem sākās pakāpeniska ražas apjomu samazināšanās ik gadus līdz pat lauka likvidēšanai, kas pirmajos trijos laukos ar labākiem nosacījumiem ir 20. gadā, bet sliktākajā laukā jau 15.gadā.

Kopējās ražas apjoms 1.laukam ar vislabākajiem augsnes un apūdeņošanas nosacījumiem pa visiem 18 ražas gadiem kopā ir 101,1 tonna. Otram laukam ar labas augsnes nosacījumiem, bet bez apūdeņošanas

7.tabula/Table 7

Ienākumi mīnus izdevumi gadā krūmmelleņu ražošanā atšķirīgos tehnoloģiskajos laukos, Ls/ha
Annual incomes minus expenses in highbush blueberry production for different technological fields, LVL/ha

Ražošanas gads Year of production	**Krūmmelleņu kultūrai atbilstoša augsne Soil suitable for highbush blueberries**		**Krūmmelleņu kultūrai neatbilstoša augsne Soil unsuitable for highbush blueberries**	
	1.lauks.Ar apūdeņošanas sistēmu Field No 1 with irrigation system	2.lauks. Bez apūdeņošanas sistēmu Field No 2 without irrigation system	3.lauks.Ar apūdeņošanas sistēmu Field No 3 with irrigation system	4.lauks. Bez apūdeņošanas sistēmu Field No 4 without irrigation system
1	-10388	-9448	-14657	-13717
2	-1803	-1803	-2728	-2728
3	-850	-825	-2250	-2425
4	284	1823	398	-602
5	6408	3883	2458	-42
6	12443	8418	6993	2993
7	15408	8383	8458	2958
8	19943	11518	12993	4493
9	18408	9883	11458	1458
10	19943	11418	12993	2993
11	15408	6883	8458	-42
12	16943	8418	9993	1493
13	15408	6883	8458	-1542
14	13943	6918	6993	-7
15	12408	5383	5458	-3042
16	13943	6918	6993	-
17	9408	3883	3958	-
18	10943	5418	5493	-
19	9408	3883	3958	-
20	7943	3918	3993	-
Kopā/Total	**205551,-**	**101755,-**	**99872,-**	**-7759**
IRR	**41%**	**32%**	**23%**	**-11%**
NPV(10%)	**65 567.21**	**30 593.88**	**25 025.13**	**-10 624.85**
Atmaksāšanās laiks/ Payback time	**6.gads 6th year**	**7.gads 7th year**	**9.gads 9th year**	**-**
Realizācijas rentabilitāte R_r Sales profitability R_r	**68.6%**	**54.2%**	**45.9%**	**-14.4%**

Avots: autoru veidots pēc Jansones I.(*Bruto seguma aprēķins...* 2007) datiem
Source: developed by the authors according to data provided by I.Jansone, 2007

sistēmas 18 gados 62,4 tonnas. Trešajam laukam ar nepiemērotu augsnes kvalitāti, bet ar apūdeņošanas sistēmu ražas kopapjoms 18 gados ir 72,4 tonnas. Ceturtajam laukam ar vissliktākajiem nosacījumiem krūmmelleņu audzēšanai trīspadsmit krūmmelleņu ražošanas gados kopējais ražas apjoms ir 24,7 tonnas. Aprēķinot vidējo atdevi katram no laukiem to pastāvēšanas laikā, pirmajam laukam tā ir 5,6 tonnas, otrajam laukam 3,4 tonnas, trešajam laukam 4 tonnas un vismazāk sanāk pēdējam ceturtajam laukam, kur vidējā atdeve gadā izdalot kopējo ražas apjomu ar visu ražas gadu skaitu ir 1,9 tonnas. Pēc šiem rādītājiem var izdarīt secinājumus, ka sekmīgai krūmmelleņu audzēšanai vēl svarīgāk par atbilstošas augsnes kvalitātes esamību ir pietiekama ūdens apjoma nodrošināšana, jo gan pēc kopējā, gan vidējā ražas apjoms trešais lauks ar salīdzinoši nepiemērotāku augsni, bet ar ūdens laistīšanas sistēmu ir par 16% ražīgāks kā otrais lauks ar labāku augsni, bet bez ūdens apgādes.

Atņemot ikgadējos izdevumus no ikgadējiem ieņēmumiem tiek iegūti ienākumi. Pēc 7. tabulas datiem parādīta ienākumu plūsma četriem dažādiem krūmmelleņu laukiem ar dažādiem pastāvēšanas nosacījumiem. Šī ienākuma plūsma liecina, ka ierīkojot jaunu krūmmelleņu lauku pirmos trīs gadus jāparedz tikai naudas izdevumi. Neliela raža gan tiek iegūta trešajā gadā, tomēr tā nav pietiekoša, lai spētu segt lauka uzturēšanas izdevumus. Ienākumi krūmmelleņu ražošanai pozitīvi kļūst ceturtajā gadā abiem laukiem labā augsnē un trešajam laukam sliktā augsnē ar apūdeņošanas sistēmu. Ceturtajam laukam sliktā augsnē bez apūdeņošanas sistēmas ienākumi pozitīvi kļūst tikai sestajā gadā. Ienākumu maksimumi visiem laukiem tiek iegūti periodā no astotā līdz desmitajam gadam, pie tam ceturtajam laukam ar visgrūtākajiem apstākļiem, kura pastāvēšanas ilgums tiek rēķināts par 25% mazāks kā pārējiem trim laukiem, no piecdesmit pastāvēšanas gadiem pozitīva ienākumu plūsma tikai sešos gados un deviņos gados ikgadējie ienākumi ir ar mīnus zīmi.

Svarīgi ir atzīmēt analīzē pieņemto, ka krūmmelleņu produkcija tiek pārdota par vidējām cenām, ņemot vērā nepiepildīto tirgu un pieaugošo pieprasījumu pēc šīs produkcijas, cenu līmenis varētu būt arī ievērojami augstāks. Tajā pat laikā pastāv arī iespēja, ka nelabvēlīgi laika apstākļi vai citi nelabvēlīgi faktori, kā mazas ražas vai slikta tirgus situācija, var arī samazināt pārdošanas apjomu un atstāt negatīvu ietekmi uz ienākumiem.

Projektā ieguldītā nauda var tikt ieguldīta alternatīvos veidos, kur tā dotu atdevi ar noteiktu procentu likmi, un salīdzināt krūmmelleņu projekta atdevi ar šo alternatīvo investīciju atdevi. Procentu likmei, kādu izvēlas šai analīzei ir jāparāda iespējami labākā zema riska alternatīva. Šajā gadījumā pieņemtā alternatīvā investīcija ir depozīta noguldījumi ar atdeves likmi 10%. Šajā analīzē izmantota investīciju projekta tīro diskontēto ienākumu metode jeb NPV.

Dati par NPV, IRR, T un realizācijas rentabilitāti atspoguļoti 8. tabulā. Ekonomiski visizdevīgākais ir 1. lauks ar apūdeņošanas sistēmu.

Secinājumi
Conclusions

1. Amerikas Savienotās Valstis ir pasaulē lielākā krūmmelleņu ražotāja, ar 70% saražotās produkcijas īpatsvaru kopējā pasaules saražotās produkcijas apjomā. Tā ir arī pasaulē lielākais krūmmelleņu produkcijas noieta tirgus.
2. Pateicoties savām dabiskajām priekšrocībām kā atbilstoša augsne, klimatiskie apstākļi, pieņemamas darbaspēka izmaksas un zemas zemes cenas, strauji pieaug Dienvidamerikas valstu saražotās krūmmelleņu produkcijas īpatsvars kopējā pasaules saražotās produkcijas apjomā.
3. Veiksmīgai krūmmelleņu nozares attīstībai Latvijā ir nepieciešami lieli kapitālieguldījumi jaunu tehnoloģiju un sistēmu ieviešanai.
4. Krūmmelleņu produkcijas tirgus nav piepildīts ne Latvijā, ne pasaulē un neraugoties uz to, ka šīs produkcijas cenas visā pasaulē ir diezgan augstas, pieprasījums pēc tām tomēr saglabājās lielāks kā piedāvājums.
5. Krūmmelleņu audzēšanai Latvijā ir labas attīstības perspektīvas. Šeit ir gan piemērotas augsnes, gan klimatiskie apstākļi, gan arī pietiekams valsts atbalsts šī biznesa veida uzsākšanai, turklāt krūmmelleņu nozare ir iekļauta valsts attīstības stratēģijā kā perspektīva un veicināma kultūra arī nākotnē.
6. Labs noieta tirgus gan Latvijā, gan ES. Vietējā tirgus piesātinājums svaigām ogām tiek prognozēts tikai tuvākās desmitgades laikā. Pie tam šis piesātinājumam iestājoties var pāriet uz ogu pārstrādi ar to iegūstot produkciju ar augstāku pievienoto vērtību.
7. Sekmīgai krūmmelleņu audzēšanai vēl svarīgāk par atbilstošas augsnes kvalitātes esamību ir pietiekama ūdens apjoma nodrošināšana.
8. Ar krūmmelleņu audzēšanu pie noteiktiem augsnes kvalitātes un laistīšanas iekārtu esamības apstākļiem Latvijā nodarboties ir ekonomiski izdevīgi.

Priekšlikumi
Recommendations

1. Zemkopības ministrijai veicināt informācijas izplatību par krūmmelleņu audzēšanas perspektīvām Latvijā.

2. Latvijas augļkopju asociācijai aktīvāk reklamēt krūmmelleņu produkciju un īpaši izcelt tā spējas būtiski uzlabot cilvēku veselību, tādējādi veicinot iedzīvotāju interesi par šo kultūru, par kuru Latvijā patērētāji tomēr samērā maz ko zina.
3. Latvijas augļkopības asociācijai kopā ar Zemkopības ministriju censties panākt lielāku valsts atbalstu krūmmelleņu audzēšanas uzsākšanai, jo ļoti lielas ir sākotnējās izmaksas un atdeve no ogu realizācijas nāk salīdzinoši vēlu, tamdēļ lielāks valsts finansiāls atbalsts krūmmelleņu audzēšanas uzsākšanai būtu ļoti labs stimuls arvien vairāk lauksaimniekiem pievērsties šīs kultūras audzēšanai.
4. Valsts ekonomiskās politikas veidotājiem lietderīgi būtu apgūt Čīles valsts ekonomiskā uzplaukuma cēloņus, jo nozīmīga daļa ir tieši krūmmelleņu industrijas straujā attīstība un sasniegumi.
5. Latvijas krūmmelleņu audzētājiem arvien aktīvāk censties izmantot pieredzes apgūšanu pie ārvalstu krūmmelleņu audzētājiem. It īpaši ļoti noderētu Polijas audzētāju zināšanas, jo Polija ir lielākā krūmmelleņu ražotājvalsts Eiropā un viņu klimatiskie apstākļi ir maksimāli līdzīgi Latvijas klimatam, līdz ar ko viņu daudz lielākā pieredze ļoti noderētu gan jau esošajiem, gan arī potenciālajiem Latvijas krūmmelleņu audzētājiem savu darbību uzsākot.

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Optimisation of the Activity of a Hungarian Pig Cooperation

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Abstract
In our research the operation of the cooperative was modelled as a generalised network problem. The cooperative provides more than 10% of Hungarian unprocessed pork. The members of the group show high heterogeneity both in production volume, and in production and breeding conditions as well. Live pigs are sold to 5 Hungarian slaughterhouses. On the input side, the goal of the cooperative is to provide breeding source materials of excellent quality and also forages of suitable value-price rate for plants with various technological potentials; on the output side, to realise the highest possible selling prices so that its members can receive higher incomes allowing them to take over more improved keeping methods. The model allows the quantification of the number of pigs from the mentioned farms to slaughterhouses, the maximum revenue from sales, the threshold prices of deliveries, and the analysis on the impacts that the members of co-operatives exert on sales revenues. The negative feedback of this information guarantees safety for the members of the network and provides knowledge that enables the production of homogenous end-product for maintaining competitiveness.
Key words: pork production, integration, network, linear programming.

Introduction
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Vertical integration links consequent activities and functions on the product path which are built on one another, and these structures are usually named by their end-products (Osinga and Hofstede, 2005; Szabó and Bárdos, 2006). A supply chain is an integrated process where raw materials are acquired, converted into products and then delivered to the consumer (Pakurár et al., 2005; Csonka and Alpár, 2007). Food supply chains are made up of organisations that are involved in the production and distribution of farm and animal-based products (Ertsey and Mainsant, 1992; Enting and Zonderland, 2006). Today integrations, national or regional product paths and not corporations compete with each other in the pig sector (Nábrádi and Szűcs, 2004; Nyárs, 2007). The dynamic conception of profitability means that an economic environment that is able to adapt to accelerated technological development, to renew flexibly and to facilitate the development of comparative advantages, is of key priority (Schulze et al., 2006a; Salamon et al., 2007). Competition in the case of pork meat is based on the sales prices, the quality of products (Krystallis et al., 2007; Bartha, 2008) and the public image of producers (Nábrádi, 2007). The structure of the production path, the level of infrastructure, human resources, biological and economic environment is the factors which determine the competitiveness of the production path in the long-term (Komlósi, 1999; Schulze et al., 2006b; Horváth, 2008). In our present study we have investigated the first factor through the example of a concrete producer enterprise. In the wake of preliminary consultations with the managers of Alföldi Sertés Értékesítő és Beszerző Szövetkezet (Alföld Pig Sales and Purchase Cooperation, APSPC), a model was needed to distribute the animals of varied quality among slaughterhouses with different requirements for the maximisation of sales revenues (APSPC, 2007). This model can also be used for other Sales and Purchase Cooperatives or it can help with refining the existing distribution methods of the cooperatives.

Methodology
In our research we modelled the operation of a purchase and sales cooperative in the East-Hungarian Region. We sought the optimal solution by the help of a network model. Our conception was very simple: to deliver pigs from each member to the slaughterhouse that pays the highest price for the produced quality. This method is advantageous for producers and slaughterhouses as well. It is advantageous for producers, as they can have higher revenues from sales; and for slaughterhouses, since they receive the product of quality that they really need.

On the basis of the above mentioned, taking the contracted slaughterhouse parameters into

consideration, the average sales price can be calculated in every aspect and based on this, the average sales price of one pig as well.

The variables of the model are the arcs of the network, i.e., there will be as many variables as many links can be created between farms and slaughterhouses. On the basis of the above data the target function of the model can be determined:

$$\sum_{i=1}^{n}\sum_{j=1}^{m} p_{ij}x_{ij} \Rightarrow MAX! \quad (i=1,2,...n;\ j=1,2,..,m) \qquad (1)$$

where

p_{ij} = the average price of pigs delivered from farm ^{i} to slaughterhouse ^{j}

x_{ij} = the average number of pigs delivered from farm ^{i} to slaughterhouse ^{j}

The constraints are defined in nodes, separately for farms and slaughterhouses. In the event of farms the total output from a farm equals to the volume of delivery if the total quantity of delivery from all the farms is lower than or equal to the quantity of delivery, otherwise a lower limit is given. In the case of slaughterhouses, the conditions will have an upper limit.

Constraints for farms:

$$-\sum x_{ij} = -T_i \text{ if } \sum T_i \le \sum S_j \qquad (2)$$

$$-\sum x_{ij} \ge -T_i \text{ if } \sum T_i > \sum S_j \qquad (3)$$

where

x_{ij} = quantity flowing on arcs towards slaughterhouse ^{j}

T_i = the number of pigs to be delivered from farm^{i}

S_j = demand of slaughterhouse ^{j}

Constraints for slaughterhouses :

$$\sum x_{ij} \le S_j \qquad (4)$$

where

x_{ij} = quantity flowing on arcs towards slaughterhouse ^{j}

This model is a linear programming (LP) application with 110 variables and 32 constraints. The solution requires widespread vulnerability studies. The shadow prices of the coefficients in the target function, the values of permissible increases and decreases present the threshold prices of certain delivery relations, and those lower and upper limits, which can include the variations of the values of the target function without modifying the optimal solution. The shadow prices related to the variables may allow the evaluation of the influences of the potential expansion or restriction of certain delivery relations on the sales revenues. The influence of the members of the Cooperative on sales revenues can be analysed by "What if…" examinations. The negative feedback of the information can provide knowledge and safety for the network members, which facilitate the production of homogenous end-products and the preservation of the competitiveness of farms.

The network model was run from the 2nd week of August for 5 weeks in 2007. On the basis of the data of the APSPC, 11 producers delivered their products to 5 slaughterhouses. According to the information of producers the data of the model can be continuously refreshed, so it can be easily applied for even weekly optimisation as well. Each farm and slaughterhouse represents two nodes in the network, allowing the simultaneous optimisation of fattening pigs and culled sows. As a result we receive data on the number of pigs to be delivered from certain farms to certain slaughterhouses, the total potential maximum revenue from sales and after breaking it down, revenues for individual farms as well.

The basic data of the network model include members' information on the expected quality and weight, and also prices and quality deductions related to various quality categories given by slaughterhouses. When comparing the findings of the model to the actual sales data, we took the following items into consideration:

- the number of pigs calculated in the studied farm-slaughterhouse relations;
- in the case of sold mass, actually transported mass;
- for quality, instead of forecasts by farms, actual qualifications by slaughterhouses.

These modifications allowed the realistic evaluation of the model results.

Results and discussion

In 2005 nineteen producer groups were granted official recognition, the number of their average members was 30, their production was 85.000 t,i.e., HUF 22 billion thus equalling to about 20% of Hungarian pig production. In 2007 there were 21 officially recognised pig producer groups in Hungary; four ones with preliminary recognition. The APSPC was established on 20 February 2003 with 26 members. The APSPC, considering the current regulations, can represent the interests of its members in terms of sales. As a result of the quantity of its produced slaughter animals, it can achieve higher prices than Hungarian average ones, exclusively due to its bargaining position.

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- in the case of sold mass, actually transported mass;
- for quality, instead of forecasts by farms, actual qualifications by slaughterhouses .

These modifications allowed the realistic evaluation of the model results. Table 1 presents the sales revenues of the study period calculated by the model and the actual sales revenues of the cooperation. Sales revenue data showed clearly that for considerable amounts of sales volumes, the application of simple network models can exploit price fluctuations as a result of various quality requirements by slaughterhouses, and thus surplus revenues can be gained.

However, further gains can be made by more precise meat quality forecasts, as this explained the necessity for the modification of the model data. These corrections reduced the value of the model target function more or less in each case. Unfortunately, farms mostly rely on the data of earlier periods and their own experience, as they lack the required measurement devices. The model

Table 1

The development of actual sales revenue before and after optimisation in the study period

Measurement unit: million HUF

		Week 1	Week 2	Week 3	Week 4	Week 5	Total
Fattening pig	Sales revenues of optimisation	93.5	78.4	114.7	90.4	123.5	500.5
	Actual sales revenues	91.2	77.0	112.6	87.9	120.2	488.9
Culled sow	Sales revenues of optimisation	6.4	3.9	5.5	4.2	7.1	27.1
	Actual sales revenues	6.3	3.6	5.4	4.0	6.7	26.0
Surplus sales revenues by optimisation, million HUF		2.4	1.6	2.2	2.7	3.7	12.6
%		2.4	2.0	1.8	2.9	2.8	2.4

is an LP application; therefore the solution requires widespread vulnerability studies. The shadow prices of the coefficients in the target function, the values of permissible increases and decreases present the threshold prices of certain delivery relations, and those lower and upper limits, which can include the variations of the values of the target function without modifying the optimal solution. The shadow prices related to the variables may allow the evaluation of the influences of the potential expansion or restriction of certain delivery relations on the sales revenues. The influence of the members of the cooperative on sales revenues can be analysed by "What if…" examinations. The negative feedback of the information can provide knowledge and safety for the network members, which facilitate the production of homogenous end-products and the preservation of the competitiveness of farms.

Table 2 presents the reduced costs of some variables and related information, which are highlighted by the the management of the Cooperative, but are not included in the optimal solution. Certain relations cannot be actually compared in terms of calculated reduced costs, as they are calculated for one animal. However, this comparison may be carried out by the average carcass weight. The findings suggest that Farm 10 can transport to slaughterhouses B, C and D only when the sales revenues calculated in the optimal solution decrease in the cooperative.

Table 3 shows the shadow prices as model solutions representing the amount of money by which further transports from certain farms increase income. The sensitivity report calculates this amount for one pig basically, but similarly to the reduced costs, it can be converted into kg/HUF unit easily in the light of average weights. Table 1 shows that the optimised sales revenues from qualified pigs is HUF 93.5 million in Week 1, marketed quantity is 2655 pigs with the carcass weight of 257032 kg based on the model's data, so the average market price is 363.96 HUF/kg.

The analysis of Table 3 clearly shows that the extension of capacities in Farms 2, 6 and 9 would increase sales revenues, as the shadow prices for 1 kg of weight are higher here than the current average prices; however, if transport capacities of Farm 10 are extended, the average prices can be reduced substantially. Statements on reduced costs already projected the conclusions on Farm 10.

Table 4 demonstrates the sensitivity report data related to slaughterhouse boundaries. The demands of Slaughterhouse 6 shall not be fully met, while

Table 2

Development of the reduced costs of some variables in the model of Week 1

Relation of transport	Number of pieces for transport	Final value pcs	Reduced cost HUF/pc	Coefficient of target function HUF/pc	Reduced cost HUF /kg	Average price HUF / kg	Upper limit HUF / kg
Farm 1-slaughterhouse B	0	0	-190.0	36638.8	-1.8	355.54	357.39
Farm 3-slaughterhouse B	0	0	-117.7	32637.6	-1.3	359.90	361.20
Farm 5-slaughterhouse B	0	0	-158.7	39532.7	-1.4	357.86	359.30
Farm 7-slaughterhouse B	0	0	-102.3	34015.1	-1.1	361.93	363.02
Farm10-slaughterhouse B	0	0	-225.8	40472.7	-2.0	350.67	352.62
Farm 11-slaughterhouse B	0	0	-105.3	35354.1	-1.1	357.37	358.44
Farm 10-slaughterhouse C	0	0	-260.8	40748.5	-2.3	353.06	355.32
Farm 10-slaughterhouse D	0	0	-221.7	41064.3	-1.9	355.79	357.71
Farm 2-slaughterhouse E	0	0	-109.7	38902.0	-1.0	362.99	364.01

Source: authors' calculations

Table 3

Shadow prices of net flow boundaries related to the quality pig sales in the model of Week 1

Name	Final value pcs	Shadow price for 1 pig	Right side of condition pc	Allowable increase pc	Allowable decrease pc	Shadow price for 1 kg weight
Net flow of Farm 1	-320	-36705	-320	60	255	-356.19
Net flow of Farm 2	-270	-39012	-270	40	80	-364.01
Net flow of Farm 3	-450	-32632	-450	60	255	-359.84
Net flow of Farm 4	-100	-31804	-100	100	255	-360.54
Net flow of Farm 5	-200	-39568	-200	200	255	-358.18
Net flow of Farm 6	-360	-30970	-360	40	80	-364.72
Net flow of Farm 7	-120	-33994	-120	40	255	-361.71
Net flow of Farm 8	-250	-34700	-250	40	80	-362.86
Net flow of Farm 9	-320	-31913	-320	40	80	-365.20
Net flow of Farm 10	-210	-40575	-210	210	255	-351.55
Net flow of Farm 11	-55	-35336	-55	55	255	-357.19

Source: authors' calculationS

Table 4

Shadow prices of slaughterhouse net flow boundaries related to pig sales in the model of Week 1

Name	Final value pcs	Shadow price for 1 pig	Right side of condition pc	Allowable increase pc	Shadow price for 1 kg weight
Slaughterhouse A	750	374	750	60	255
Slaughterhouse B	250	124	250	40	80
Slaughterhouse C	480	434	480	40	80
Slaughterhouse D	550	711	550	40	80
Slaughterhouse E	625	0	880	1E+30	255

Source: authors' calculations

the other slaughterhouses will receive the required quantities. The comparison of shadow prices of Slaughterhouse A, B, C, and D clearly indicates that if a sequence is to be set up for potential excess or re-grouped quantities, the sequence of Slaughterhouses D – A – C – B seems to be acceptable (the sequence of D – C – A – B seems unacceptable, as A shadow prices are lower than that of C; however, its allowable increase is higher).

Conclusions, proposals, recommendations

In Hungary the pig population dramatically dropped after 1990, the date of political transformation and this tendency has been going on since then. The loss of export markets, outdated industrial farms, the reduction of plant sizes, and the termination of integration in production were the clear-cut reasons of the fall in the 1990s. A part of the above-mentioned reasons still exist these days; however, since 2003 the majority of producers have increasingly integrated in producer groups, which have higher potentials to push their own interests. The compliance with requirements related to environmental and animal protection means increased burdens for pig farmers. Outstandingly high feedingstuff prices and resulting low pork prices in 2007 should not be disregarded. All these factors resulted in reaching the historically lowest level of pig population. In Hungary the level of vertical integration operating before the 1990s and still operating in highly developed European countries does not exist today. Pig farmers are vulnerable to

slaughterhouses and meat processors, which are also vulnerable to multinational commercial chains. Only a small proportion of Hungarian pig population is processed in this closed chain. (Feedingstuff production – feedingstuff manufacture – pig keeping – slaughtering – processing – the distribution of meat and meat products are controlled by producers.)

On the basis of our earlier statements, there is not integrated supply chain in Hungarian pork product chain. The manifestation of supply chain means, even at best, only the strengthening of vertical relations or movement into strategic directions. The member of the product chain, being in an economically superior position, shapes and manages relations in general and as a single participant, comprehends the chain completely. The acceptance of this unilateral and informal character as an invariable fact preserves anomalies found in the product chain, and it causes low efficiency. Therefore, the supply chain integration is crucial for the future competitiveness of Hungarian pork sector.

These issues incited us to develop a model for the maximisation of sales revenues from the viewpoint of pig farmers. Mathematically the model is simple and its practical application seems to be easy. However, its implementation is hampered by the deficiency of farm records, as it renders the calculation of expectable quality and average prices uncertain. By the feedback of production information, the APSPC makes farmers on lower production levels as well produce better quality and more homogeneous source material for slaughter, thus they can achieve higher revenues. The extra income generated by the application of the model provides potentials for survival in years similar to 2007, and for improvement in normal or more favourable years.

Thus our long-term farming can be more balanced, which affects the production safety of the other members of the chain; therefore, profitability risk can be reduced in the whole chain. However, it should become clear for political decision-makers that regulations should enhance the quality awareness of each member in the chain.

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Changes in the Structure and Economic Result of the Vegetable Products Processing Sector in Poland on the Conditions of Integration into the European Union

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Abstract

The food industry constitutes an important link in the marketing chain of food. It combines the area of agricultural production with the trade and consumption links. An important role in the structure of this industry is played by the branches processing farm raw materials of vegetable origin. This paper is an attempt to define the changes in the structure, functioning, and the economic result of these sectors on the conditions of the integration of Poland into the European Union structures. The accessible statistical data enabled a compilation of a set of ratios that characterise the structure and the economic result of the particular sectors of the food processing industry. The main directions and the dynamics of changes have been defined by the comparison of the mentioned ratios for the years 2006 and 2003.

The research justified that the analysed branches revealed a noticeable tendency of a diminishing number of entities operating on the market with a simultaneous increase in employment and the value added. The majority of the examined sectors showed the ratios describing the efficiency of activities being at a higher level than their level in the general food industry and the whole Polish industrial processing.

Key words: vegetable products, gross operating surplus, personnel costs, apparent labour productivity.

Introduction

The agricultural and food industry is the main link in the marketing chain of food. It combines the area of agricultural production with the trade and consumption links. The basic function of the food processing industry is transformation of agricultural raw materials into foodstuffs, which are eligible for transportation, storage, consumption or further processing[1]. Due to the position of this industry in the food chain, it can influence farmers through the purchasing strategies[2]. It can also influence consumer markets through marketing policies. After 1990 the agricultural and food industry in Poland underwent the processes of structural changes. The manner and principles of its functioning were changing as well as the economic result of the enterprises which were active in this sector of the national economy. Since 2004 enterprises of the agricultural and food industry have been functioning within a common European market. This situation originates a new direction for the development processes in these industrial branches.

The aim of this paper was to present the alternations in the structure, economic result and efficiency of the processing of vegetable products in Poland after two years of the country's functioning in the common European market.

The research aim enabled to advance the hypothesis that the processes of the EU integration affected the organisation structure of Polish food industry enterprises, and enabled the improvement of their outcomes.

The examination covered the food processing branches which deal with the processing of agricultural vegetable products. These branches are related to processing and preservation of potatoes, production of fruit juice, processing of fruit and vegetables, production of oils and vegetable fats, products of grain milling, starch production and sugar industry. These branches constitute the basic links of the original processing of agricultural products such as grain, potatoes, sugar beets, canola and other oil plants as well as fruit and vegetables.

[1] R. L. Kohls, J. N. Uhl, Marketing of agricultural products. MACMILLAN PUBLISHING COMPANY, New York 1990, s. 76

[2] A. Zalewski, Problemy gospodarki żywnościowej w Polsce, PWN, Warszawa 1989, s. 194

The presented analysis is divided into two parts. The first one describes the structural details of vegetable products processing in Poland. The assessment covered the alternations in the number of enterprises, volume of employment and the value added. This part specified also the changes in the functioning of the particular branches dealing with the processing of agricultural vegetable raw materials. It presented the dynamics of turnover, profit, costs and investment expenditures. The following ratios have been applied: T- *turnover or gross premiums written*, GOS - *gross operating surplus*, OC - *operating costs, TPGS – total purchases of goods and services,* PC – *personnel costs*, GITG - *gross investment in tangible goods.*

The paper ends with the analysis of the operating efficiency of the particular food industry sectors in Poland. The following ratios have been used in this assessment: W1- the share of investment related to the things in the operational costs = investment related to things / operational costs, W2 – the share of the purchased goods and services in the operational costs = costs of raw materials and services / operational costs, W3 – the share of labour costs in the operational costs = labour costs /operational costs, W4 - average personnel costs = the average labour cost per 1 employee in thousand EUR (personnel costs per employee) (thousand euro), W5 - apparent labour productivity = gross value added per person employed, W6 - wage adjusted labour productivity = apparent labour productivity by average personnel costs (%), W7 - gross operating rate (%) = gross operating surplus/turnover.

The source basis for the paper includes the statistical data taken from the database of Eurostat (**Structural Business Statistics) for the years 2003 and 2006 concerning the groups and classes of economic activity related to the processing of agricultural vegetable products. The data for 2006 demonstrate the status of the food processing sector after one year of operating on the European market. The year for comparison is the year 2003 which is the last year preceding Polish membership in the European Union.**

1. Structural characteristics of the processing of vegetable products in Poland

In 2006 according to the data of Eurostat Poland accounted for almost 17 thousand enterprises operating in the area related to the processing of food products and the production of beverages marked as Section 15 in the subsection of DA in the system of economic activity classification NACE[3]. Almost 448 thousand persons were employed in this area (17.3% of them were employed in Polish industry). The value added for these branches was almost EUR 7.5 billion, which constituted 16.5% of the value added of industrial processing in Poland.

Table 1 presents the significance of the particular branches related to the processing of vegetable products in the food processing market in Poland. The most significant ones regarding the number of enterprises and the size of employment were the sectors of fruit and vegetables processing, and the grain-milling industry. From the point of value added, the dominant branches were sugar industry and processing of fruit and vegetables. Totally, in 2006 the examined branches processing agricultural vegetable products accounted for 24.4% of the share in the value added of the food and beverages industry. In the scope of employment and number of enterprises the ratios were 15.3% and 13.5% respectively.

The analysis of the basic figures characterising the structure of food industry in Poland in the years 2003-2006 indicates a decrease in the number of entities operating in the processing of vegetable products. The number of enterprises in the examined period fell by nearly 7%. The most serious reduction level concerned the number of entities in the sugar and potato industries. An increase in the number of companies was noted in two sectors, i.e., starch processing, and production of oils and vegetables fats. The dynamics of changes in the value added of vegetable products processing branches was considerably higher than the increase of the value added both in the whole food industry and Polish processing industry.

Table 2 presents the alternations in the result of the particular branches dealing with the processing of agricultural vegetable raw materials.

The dynamics of turnover, profit, costs and investment expenditures was assessed for the period 2003 - 2006. The following ratios were used in the assessment: T- *turnover or gross premiums written*, GOS - *gross operating surplus*, OC - *operating costs, TPGS – total purchases of goods and services,* PC – *personnel costs*, GITG - *gross investment in tangible goods*. The presented data indicate that the dynamics of revenues in all the analysed branches was at a higher level than the dynamics of operational costs.

[3] NACE - Statistical Classification of Economic Activities in the European Community. A developed version of this classification is PKD - Polska Klasyfikacja Działalności (Polish Classification of Business Activity).

Table 1

Number of enterprises, the value added and the level of employment in the sector of foodstuffs and beverages as well as in the main branches of vegetable products processing in Poland in 2006

Specifications	LP		VA		LZ		LP	VA	LZ
	number	**%**	**million EUR**	**%**	**number**	**%**	**2003=100**		
Manufacturing (d)	194399		45438.1		2590854		98	124	109
Manufacturing of food products and beverages (da15)	16996	100	7479.4	100	447969	100	95	108	102
Processing and preserving of potatoes (da15310	56	0.3	169.9	2.3	5365	1.2	85	189	104
Manufacturing of fruit and vegetable juice (da1532)	126	0.7	206.7	2.8	7734	1.7	98	190	124
Processing and preserving of fruit and vegetables n.e.c.(da1533)	959	5.6	498.1	6.7	30007	6.7	97	162	110
Manufacturing of vegetable and animal oils and fats (da154)	115	0.7	125.6	1.7	3989	0.9	131	168	131
Manufacturing of grain mill products (da1561)	986	5.8	210.8	2.8	11098	2.5	89	117	90
Manufacturing of starches and starch products (da1562)	18	0.1	21.2	0.3	1220	0.3	129	194	107
Manufacturing of sugar (da1583)	38	0.2	589	7.9	9277	2.1	51	195	67

LP- Number of enterprises, VA- Value added at factor cost, LZ- Number of persons employed,

Source: Annual detailed enterprise statistics on manufacturing subsections DA-DE (incl. food, beverage, tobacco, textiles, leather, wood, and paper) and total manufacturing (NACE D) (part of Annex 2), Eurostat (SBS), January, 2009

Table 2.

Changes in the basic ratios describing the functioning of the vegetable products processing branches in Poland in the years 2003 and 2006

Branches	T	GOS	OC	TPGS	PC	GITG	T	GOS	OC	TPGS	PC	GITG
	million EUR						2003=100					
Manufacturing (d)	196701.5	25316.3	171385.2	147398.5	20121.8	10666.7	160	113	171	161	142	167
Manufacture of food products and beverages (da15)	37683.6	4269.5	33414.1	28825.8	3209.9	1845.4	138	97	146	133	128	144
Processing and preserving of potatoes (da15310	392.6	108.1	284.5	271.4	61.8	18.8	124	226	106	114	147	168
Manufacturing of fruit and vegetable juice (da1532)	990.8	137.8	853	810.3	68.8	72.7	157	240	148	141	134	165
Processing and preserving of fruit and vegetables n.e.c.(da1533)	2116..3	282.5	1833.8	1678.7	215.6	115.4	132	186	126	119	138	161
Manufacturing of vegetable and animal oils and fats (da154)	753.1	80.4	672.7	722.1	45.2	17.6	144	184	140	161	144	107
Manufacturing of grain mill products (da1561)	1094.9	131.4	963.5	933.6	79.4	52.9	111	115	110	109	119	90
Manufacturing of starches and starch products (da1562)	70.8	10	60.8	46.7	11.2	7.9	122	323	111	88	144	176
Manufacturing of sugar (da1583)	1423.8	475.3	948.5	894.6	113.7	87.2	127	312	98	92	76	198

Source: see Table 1

Table 3

Efficiency ratios for the vegetable products processing sector in Poland in 2003 and 2006

Branches	W1	W2	W3	W4	W5	W6	W7
	%	%	%	thou. EUR	thou. EUR	%	%
	2003						
Manufacturing (d)	6.4	91.3	14.1	6.8	15.4	224.7	18.3
Manufacturing of food products and beverages (da15)	5.6	94.8	11.0	6.2	15.7	251.9	16.1
Processing and preserving of potatoes (da15310	4.2	88.8	15.6	8.5	17.4	205.5	15.2
Manufacturing of fruit and vegetable juice (da1532)	7.7	100.1	8.9	8.2	17.4	211.8	9.1
Processing and preserving of fruit and vegetables n.e.c.(da1533)	4.9	96.8	10.7	5.9	11.3	190.2	9.5
Manufacturing of vegetable and animal oils and fats (da154)	3.4	93.2	6.5	10.7	24.5	229	8.3
Manufacturing of grain mill products (da1561)	6.7	97.7	7.7	6.3	14.7	234.2	11.5
Manufacturing of starches and starch products (da1562)	8.2	96.2	14.2	6.6	9.6	145.6	5.3
Manufacturing of sugar (da1583)	4.6	100.2	15.4	9.9	21.7	219.8	13.6
	2006						
Manufacturing (d)	6.2	86.0	11.7	8.9	17.5	196.6	12.9
Manufacturing of food products and beverages (da15)	5.5	86.3	9.6	8	16.7	208.9	11.3
Processing and preserving of potatoes (da15310	6.6	95.4	21.7	14.2	31.7	222.8	27.5
Manufacturing of fruit and vegetable juice (da1532)	8.5	95.0	8.1	9.6	26.7	278.6	13.9
Processing and preserving of fruit and vegetables n.e.c.(da1533)	6.3	91.5	11.8	7.9	16.6	211.2	13.3
Manufacturing of vegetable and animal oils and fats (da154)	2.6	107.3	6.7	13.2	31.5	238.2	10.7
Manufacturing of grain mill products (da1561)	5.5	96.9	8.2	8.1	19	233.8	12
Manufacturing of starches and starch products (da1562)	13.0	76.8	18.4	8.8	17.4	198.2	14.1
Manufacturing of sugar (da1583)	9.2	94.3	12.0	13.2	63.5	481.9	33.4
	2006-2003						
Manufacturing (d)	-0.1	-5.3	-2.4	2.1	2.1	-28.1	-5.4
Manufacturing of food products and beverages (da15)	-0.1	-8.6	-1.4	1.8	1.0	-43.0	-4.8
Processing and preserving of potatoes (da15310	2.4	6.6	6.1	5.7	14.3	17.3	12.3
Manufacturing of fruit and vegetable juice (da1532)	0.9	-5.1	-0.9	1.4	9.3	66.8	4.8
Processing and preserving of fruit and vegetables n.e.c.(da1533)	1.4	-5.3	1.0	2.0	5.3	21.0	3.8
Manufacturing of vegetable and animal oils and fats (da154)	-0.8	14.1	0.2	2.5	7.0	9.2	2.4
Manufacturing of grain mill products (da1561)	-1.2	-0.8	0.6	1.8	4.3	-0.4	0.5
Manufacturing of starches and starch products (da1562)	4.8	-19.4	4.2	2.2	7.8	52.6	8.8
Manufacturing of sugar (da1583)	4.6	-5.9	-3.4	3.3	41.8	262.1	19.8

Source: see Table 1

2. Changes in the economic result in the food processing sector in Poland in the years 2003 and 2006

Special ratios were selected to present the economic situation of the vegetable products processing enterprises in Poland. They gave grounds for an attempt of the analysis as well as an attempt of defining the efficiency and relations that are formed among certain specific economic categories. Table 3 presents a list of ratios for the processing of vegetable articles in Poland in 2003 and 2006.

The employees are the crucial component of the productive potential of an enterprise. The share of labour costs in operational costs (W3) in the food and beverages processing sector in 2006 was 9.6%. The largest share of labour costs in operational costs was noted in the potato and starch production industry (27.1% and 18.4% respectively). In three branches, i.e., production of oils and vegetable fats, production of fruit and vegetable juices, and in the grain-milling industry, in 2006 the value of this ratio was at a lower level than the average in the food industry in Poland. The highest average labour costs in the analysed food processing branches in 2006 were incurred in the production of fruit and vegetable juices, and in the fat and sugar industry. In the remaining branches, the labour costs stayed at the level close to the average for Polish processing industry. The research indicates also a clear rise of the labour costs. In the period 2003 -2006, in the branches such as production of fruit juice, production of vegetable oils, and the starch and sugar industries, the labour costs have increased to a greater extent than the average for industrial processing being at the level of 2.1%.

The efficiency calculated as the relation of the gross value added per 1 employee in most of the vegetable product processing branches was at a higher level than the total average for food industry and industrial processing in Poland. In this area the highest ratios described the sugar industry, production of fruit and vegetable juices as well as vegetable fat production.

The profitability of an enterprise is considered to be the fundamental measurement of the efficiency of its operations. In general, we calculate the profitability as a relation of profit to revenue or to revenue-earning costs[4]. Operational profit takes the main position in the enterprise profitability analysis. It enables the profitability analysis by focusing on the basic activity of an enterprise. The operational profit margin ratio, which grows with time, reflects the good situation of an enterprise. Among others, it provides the information on the volume of sales, the shaping of an adequate structure of assortment, and achieving profitable prices or lowering the costs of an enterprise's activity. The operating profit margin was taken from the list of ratios defining the profitability of enterprises. Its average value for the processing of foodstuffs and beverages in Poland was 11.3%. The analysed branches dealing with vegetable products processing were generally characterised by a higher level of the operational profit margin than the average value for the food industry. The highest level of this ratio in 2006 was achieved by the sugar industry and the production of fruit and vegetable juices (33.4% and 27.5% respectively).

Conclusions

The conducted research on the food processing branches dealing with vegetable raw materials processing in Poland indicates certain changes in the structure of entities. Consolidation processes have been explicitly noticeable in all branches. In this way companies pursue an extended scale of activity, takeover of markets, product and geographical diversification of their operations, and thus, a stronger position on the market. An important role in the process is played by entities with foreign capital. The activity of international companies is visible practically in all the analysed branches of the food industry.

The economic result achieved by the researched branches of the food industry change in time. They also show a significant diversification in the section of the particular branches. After the accession to the European Union, the ratio of revenue dynamics was higher than the operational costs in all the branches of vegetable products processing. The improvement was also noted in the efficiency of activities measured as the value added per one employed person and the operational profit margin.

We should expect that opening of the Polish market related to the products from the EU countries will force further changes on the Polish food market that would be characterised by the development of consolidation and improvement in efficiency of the food processing.

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Tendencies for the Development of Agriculture Technique Provision in Rural Farms of Vidzeme Region

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Abstract
The labour, changes in the dynamics of sowing area, and development of the number of agricultural technique units are characterised in surveyed in the dynamics of the number and size of Vidzeme region economically active rural farms (2001–2007). The research is done on the provision of agricultural machinery per agricultural land in economically active rural farms, the structure of tractor age and specific weight, the proportion of provision of roadworthiness test passed tractors per agriculture land, the dynamics of number of unused tractors, the average capacities of the registered tractors as well as their provision per agricultural land.
Key words: agricultural technique / machinery, provision, farm, economy.

Introduction
The efficiency of agricultural production has to be raised producing more by means of less work, fuel and other resources to ensure the necessary agricultural production. The question on provision of agricultural machinery, its improvement and modernisation is drawn here as an important factor. The rise in fuel prices, usage of more expensive agricultural machinery, and other resources becoming more expensive influence the expenses of agricultural production. Several scientific institutions and scientists have investigated these problems in Latvia.

A.Vilde (Vilde,1997) has done a research on fuel savings, raising of production efficiency, and possibilities to reduce expenses in soil preduction.

D.Viesturs and N.Kopiks have elaborated a computer software technology for the analysis of technologies that allows modelling of dependence of cultivated crop production expenses on the main determining factors (Kopiks, Viesturs, 1999).

Latvian Rural Consultation Centre elaborates and summarises gross coverage calculations of agricultural enterprises depending on production intensity level and production specifics (Latvian Rural Consultation and Education Centre Ltd, 2007).

Latvian State Institute of Agrarian Economics gathers annual data selections on the economic results of Latvian rural farm holdings (SUDAT, 2006).

These researches, however, are not dedicated to deeper research of rural farm provision with agricultural machinery in Vidzeme region of Latvia. The authors of this article have characterised provision of rural farms with agricultural technique in Vidzeme region, and they have done a research on its development tendencies in the past seven years.

Hypothesis**.** Provision with agricultural machinery is connected with the age of tractor fleet and possibilities to purchase new technique.

The aim of the study is to investigate tendencies related to the provision of agricultural machinery in rural holdings of Vidzeme region.

The following tasks are set for reaching the aim:
1) to characterise economically active rural holdings in Vidzeme region;
2) to investigate tendencies in provision with agricultural machinery;
3) to analyse the age of the present rural farms tractors following the time of acquisition, capacity ,and technical parameters.

Materials and methods. Calculation constructive method, comparative method, monographic method, and graphic method are used for data and research processing. The research is based on the PhD student's theoretical and practical knowledge, and the research is done in the framework of PhD paper. The data from the Central Statistical Bureau, Internet materials, press publications, data of rural farm structure survey in Latvia for the period of 2001–2007 as well as the data from the State Technical Inspection Agency are used for the development of the research.

Results and Discussion
Rural farms and holdings of Vidzeme region are mainly doing crop cultivation and production of agricultural products as they have adequate and

suitable weather and climatic conditions. The data of 2007 show that 21.4 thousand economically active farms managing 667.2 thousand ha of land, including agricultural land in the area of 403.6 thousand ha or 60.5% of the total land of the farms, were observed in the regions of Latvia. The number of economically active farms in Vidzeme region has decreased by 6.1 thousand or 22.2% compared with 2001.

The number of farms and holdings (Table 1) in recent years is diminishing, while the area of lands managed by the farms is increasing due to its renting to other owners.

The average size of Vidzeme region rural farm has increased from 24.5 ha in 2001 to 31.2 ha in 2007 or by 27.4%, the area of agricultural land per one farm has increased by 35.0 % on average. Many of the country farms doing real agricultural activities are renting their land to active operating rural farms.

In 2007 the number of economically active rural farms equalled to 113.4 thousand and they managed 2892.6 thou. ha of land, including total agricultural land of 1930.9 thou. ha or 66.8% of the total land area. The number of economically active holdings and farms in Latvia has decreased by 47.3 thou. ha or 19.8% compared with 2001.

The specific weight of Vidzeme region economically active rural farms constitutes 18.9% of the total number of Latvia' s rural farms in 2007, the

Table 1

Dynamics of number and size of economically active rural farms in Vidzeme region (2001 – 2007)

Indicators	2001	2003	2005	2007	2007/2001, %
Number of rural farms	27502	25190	25476	21410	-22.2
Total area of manageable land, thousand of ha	669.4	666.4	724.7	667.2	-0.3
Included agricultural land, thou. ha	386.0	375.7	402.8	403.6	4.6
Agricultural land, %	57.7	56.4	55.6	60.5	4.9
Total area per one farm, ha	24.5	26.5	28.4	31.2	27.4
Including agricultural land managed by one farm, ha	16.5	15.0	15.8	18.9	14.5

Source: author's research following the data of the Central Statistical Bureau (2001 – 2007)

Table 2

Dynamics in the changes of sowing areas in Latvia and Vidzeme region (2001 – 2007)

Indicators	2001	2003	2005	2007
Total area of sowings in Latvia; thou. ha	869.8	851.1	996.6	1126.2
Base increase rate,%	0	-2.1	14.6	29.5
including crops in Latvia; thou. ha	443.7	428.5	468.9	521.9
Specific weight of crop sowings in Latvia,%	51	50.3	47.0	46.3
Base increase rate,%	0	-3.4	5.7	29.5
Total area of sowings in Vidzeme region; thou. ha	159.8	133.3	163.5	187.5
Base increase rate,%	0	-16.6	2.3	17.3
including crop sowings in Vidzeme region; thou. ha	65.9	63.8	71.4	84.0
Base increase rate,%	0	-3.2	8.4	27.4
including specific weight of crop sowings in total Vidzeme region sowings; %	14.9	14.8	15.2	16.1

Source: author's research following the data from the Central Statistical Bureau (CSB) (2001 – 2007)

specific weight of the total area is 23.1%, while the proportion of agricultural land is 29.9%.

Totally in three different size economic farm groups of Vidzeme region, (Table 3) the value of the produced goods per one ha of agricultural land has increased by LVL 159.1, net income – by LVL 135.0 , but the value of the received crop production – by LVL 61.2 in the recent years.

Rural farms have started their development at the very end of the 1980s and the beginning of 1990s. Increase in the number of agricultural machinery units was very fast during privatisation process of collective and state farms. Then it was possible to acquire different types of machinery for shares.

In Vidzeme region (Table 4) the dynamics of agricultural technique unit number is different if we compare separate units of machinery. From 2001 to 2007 the number of sowing machines has increased by 311 units or 15.9%; the number of tractor trailers has increased by 1026 units or 16.4%; the number of

Table 3

Changes of production intensity in Vidzeme region by different economic size rural farms (2001 – 2006)

Indicators	2001				2006			
	Average in Vidzeme	ESU 4<8	ESU 16 - 40	ESU 100 - 250	Average in Vidzeme	ESU 4<8	ESU 16 - 40	ESU 100 -250
Value of produced goods per 1 ha of agricultural land, LVL	173.5	201.2	238.7	282.5	332.6	242.8	349.5	386.3
Net income per 1 ha of agricultural land, LVL	13.5	42.6	16.4	25.5	148.5	147.9	157.2	83.1
Crop production per 1 ha of agricultural land, LVL	105.7	104.2	117.8	129.2	166.9	152.4	173.9	186.2

Source: author's research following SUDAT 2001, 2006

Table 4

Dynamics of the number of agricultural technique units in rural farms of Vidzeme region (2001 – 2007)

Description	2001	2003	2005	2007
Trucks	2266	x	1253	1022
Base increase rate, %	0	0	-44.7	-54.9
Wheel tractors	11195	11087	11131	12358
Base increase rate, %	0	-1.0	-0.6	10.4
Caterpillar tractors	964	657	663	492
Base increase rate, %	0	-31.8	-31.2	-49.0
Trailers of tractors	6239	6238	6280	7265
Base increase rate, %	0	0.0	0.7	16.4
Ploughs	6110	6010	5929	6193
Base increase rate, %	0	-1.6	-3.0	1.4
Cultivators	6538	6555	6424	6601
Sowing machines	1491	x	1555	1802
Base increase rate, %	0	0	4.3	15.9
Combines harvesters	1023	x	1044	1038
Base increase rate, %	0	0	2.1	1.5

Source: author's research following the CSB data (2001 – 2007)

wheel tractors has increased by 1163 units or 10.4%; the number of crop harvester combines comparatively has increased not much – only by 1.5% and ploughs – by 1.4%.

The biggest decrease in the number of agricultural technique (2001–2007) is observed in case of trucks- 54.9%, and caterpillar tractors- 49.0%. The reason is that the machinery produced in the Soviet times was mainly working on petrol – non-economical, and morally obsolete, but the caterpillar tractors – economically non-effective and profitable in exploitation.

In Vidzeme region (Table 5) the increase in the provision of agricultural machinery per one thousand ha of utilised agricultural areas in economically active rural farms (2001–2007) appears the following: wheel tractors – by 6.9%, tractor trailers – by 12.5%, but the decrease in the number of provision relates to crop harvester combines – by 3.0%, cultivators – by 5.9%, and ploughs – by 6.3%. Those tractors that were acquired for shares from collective and state farms are morally and physically obsolete. Therefore new powerful tractors and trailers with different load capacity are purchased; and thus work is made more productive. The crop combines used in rural farms are generally more productive, though ploughs and cultivators have better quality and are more solid.

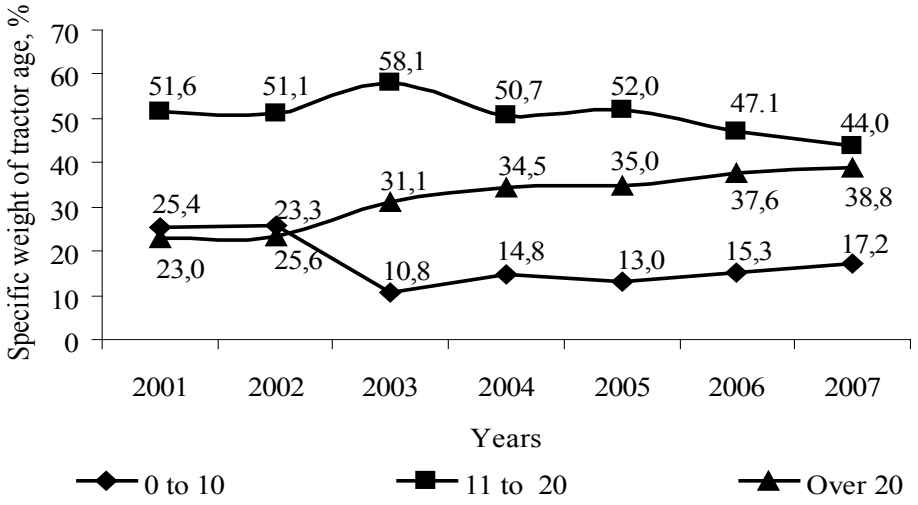
In Vidzeme region (Figure 1) the specific weight of tractors newer than 20 years has increased by 5.8% in rural farms from 2001 to 2007, but since 2003 the specific weight of tractors that are younger than 10 years has grown by 6.4%. The specific weight of tractors in the analysed period of time has decreased by 7.6% for 11-20 years old tractors. We conclude

Table 5

Provision of agricultural technique per 1000 ha of agricultural land in economically active rural farms of Vidzeme region (2001 – 2007)

Description	2001	2003	2005	2007	2007/2001, %
Trucks	6	x	3	3	-50.0
Wheel tractors	29	30	28	31	6.9
Caterpillar tractors	2	2	2	1	-50.0
Tractor trailers	16	17	16	18	12.5
Ploughs	16	16	15	15	-6.3
Cultivators	17	17	16	16	-5.9
Sowing machines	4	x	4	4	0.0
Crop harvester combines	3	x	3	3	0.0

Source: author's research following the data of CSB (2001–2007)



Source: author's research following the data from the State Technical Supervision Agency (VTUA) (2003–2007)

Figure 1**. Breakdown of the specific weight of tractor age in Vidzeme region, % (2001 – 2007)**

that the tractor fleet in rural farms is gradually growing older. Most of the holdings are not able to renovate tractor fleet and purchase new tractors due to the economic situation.

The number of tractors registered in the State Technical Supervision Agency (STSA) from 2001 to 2007 (Table 6) has increased by 6.1%, but the number of tractors that have passed roadworthiness test in the analysed period of time has decreased by 7.3%. So the provision of number of tractors has diminished by 11.3% per 1000 ha of agricultural land. Increase in the number of old non-used tractors and the number of technically not ready for exploitation tractors negatively influence the specific weight of dynamics of the tractors that have passed roadworthiness test.

When comparing data from the Central Statistical Bureau and State Technical Supervision Agency in Table 7 (2001–2007) we can conclude that the specific weight of really non-operating and non-used tractors has increased from 19.6% in 2001 to 19.8% in 2007. It testifies that timely crossing off the register has not been carried out for non-used tractors. Especially it concerns caterpillar tractors. It is because of laziness of rural farm owners and their passive attitude. Punitive system does not exist for deficiencies of tractor register.

Table 6

Specific weight of tractors that have passed roadworthiness test and provision per 1000 ha of agricultural land (those really operating), (2001 – 2007)

Indicators	2001	2003	2005	2007	2007/2001, %
Tractors registered in the State Technical Supervision Agency	15117	14942	15539	16033	6.1
Tractors that passed roadworthiness test	7159	7412	7078	6638	-7.3
% of the total number of registered tractors	47.4	49.6	45.5	40.1	-15.4
Provision of tractors with passed roadworthiness test per 1000 ha of agricultural land	0.19	0.20	0.18	0.16	-11.3

Source: author's calculations following the data of the State Technical Supervision Agency (2001 – 2007)

Table 7

Dynamics of the number of non-used tractors (2001 – 2007)

Indicators	2001	2003	2005	2007	2007/2001, %
Wheel tractors (following farm inspection data)	11195	11087	11131	12358	10.4
Caterpillar tractors (following farm inspection data)	964	657	663	492	-49.0
Total (wheel tractors and caterpillar tractors)	12159	11744	11794	12850	-3.4
Tractors registered in the State Technical Supervision Agency	15117	14942	15539	16033	6.1
Number of tractors that passed roadworthiness test	7159	7412	7078	6638	-7.3
% of the total number of wheel and caterpillar tractors	47.4	49.6	45.5	40.1	15.4
Difference between registered in STSA and total number of tractors	-2958	-3198	-3790	-3183	7.6
Specific weight of really non-operating or non-used tractors, %	19.6	20.3	24.1	19.8	3.1

Source: author's calculations following the data from STSA and the Central Statistical Bureau (2001 – 2007)

Table 8

Changes in wheel tractor provision by capacity (kW) per area of agricultural land in Vidzeme region (2001 – 2002)

Indicator	Number of wheel tractors	Including the capacity, kW			
		<40	40-60	60-100	>100
2001	11195	6171	2889	1674	461
Specific weight; %	x	55.1	25.8	15.0	4.1
Provision per 1000 ha of agricultural land (AL)	29	16	8	4	1
2003	11087	5820	2625	2198	445
Specific weight; %	x	52.5	23.7	19.8	4.0
Provision per 1000 ha of AL	30	16	7	6	1
2005	11131	5683	2689	2239	520
Specific weight; %	x	51.1	24.2	20.1	4.7
Provision per 1000 ha of AL	28	14	7	6	1
2007	12358	6210	2846	2385	916
Specific weight; %	x	50.3	23.0	19.3	7.4
Provision per 1000 ha of AL	30	15	7	6	2

Source: author's research following the data from the Central Statistical Bureau (2001 – 2007)

When comparing the provision of wheel tractor capacity per utilised agricultural areas (Table 8) in the analysed period the specific weight of tractors with the capacity from 60 to 100 kW has increased by 4.3%, but for those over 100 kW - by 3.4%. The specific weight of tractors with small capacities 40 kW–60 kW has decreased as their usage is not economically efficient for production of large land areas.

In the time period from 2001 to 2007 the owners of Vidzeme region rural farms (Table 9) have acquired 951 different new tractors. Tractors with the capacity of 80 Hp have got the highest specific weight in rural farms - 26.3%, 90 HP tractors – 18.6% and 110 HP tractors – 11.1%, as these tractors can be used economically suitable in crop cultivation and cattle breeding. The majority of new tractors were purchased in 2005, namely, 226 units, when there was the most favourable economic situation in Latvia. In the period of 2001–2007 the purchase of new tractors has increased in rural farms by 196.6% or 3 times. At the beginning of the analysed period in 2001 Byelorussian production BELARUS tractors were purchased equalling to 75.0% as distributor sets for the rest of tractor types were not developed yet. In the period of 2001–2007 the specific weight of the sold new BELARUS tractors in rural farms decreased and reached 25.1% in 2007. Anyway it is the highest specific weight of the sold tractors among different tractor brands. The second highest specific weight of sold new tractors in 2007 is with VALTRA – 22.9%, followed by JOHN DEERE tractors – 13.1%.

When choosing the tractor brand for tractors with capacities 80 to 90 HP owners of rural farms mainly evaluate the price of a tractor, and technical service possibilities; while only then suitability for production and operation conditions.

The average capacity of registered tractors (Table 10) in the period of 2001–2007 has increased by 33 HP for 0-1 year's old tractors, for 2 year old tractors – by 20 HP, for 3 year old tractors – by 22 HP, for 4 year old tractors – by 3 HP, but for 6 year old tractors – by 43 HP. In the period from 2001 to 2007 the total average capacity of one tractor registered in the State Technical Supervision Agency has increased from 58 HP to 68 HP. Total capacity of the registered tractors in the years from 2001 to 2007 has decreased by 46595 HP or 41.0%. It is because in 2007 compared with 2001 economically active rural farms became more stable in their economic operation. If there is no possibility to extend the usage of agricultural land areas, and due to economic situation in the state the farms do not acquire new tractors.

The research carried out and conclusions confirm the advanced hypothesis of the study.

Table 9

Sales dynamics of new tractors and breakdown by capacity (HP) (2001 – 2007)

Capacity (HP)	2001	2002	2003	2004	2005	2006	2007	Total number of tractors, 2001 - 2007	
								Number	%
10	x	x	x	x	1	1	x	2	0.2
20	x	x	2	1	2	x	1	6	0.6
30	8	17	16	8	x	7	7	63	6.6
40	x	x	x	1	x	x	2	3	0.3
50	2	3	3	2	1	2	5	18	1.9
60	2	3	1	2	x	7	5	20	2.1
70	x	x	x	x	2	x	3	5	0.5
80	36	36	48	44	51	15	20	250	26.3
90	9	13	24	41	56	15	19	177	18.6
100	x	4	10	14	25	18	35	106	11.1
110	1	2	11	11	23	12	27	87	9.1
120	x	2	4	6	19	2	5	38	4.0
130	x	x	10	6	11	4	5	36	3.8
140	1	x	7	3	8	4	13	36	3.8
150	x	x	3	5	10	3	6	27	2.8
160	x	2	6	2	6	2	6	24	2.5
170	x	1	1	8	2	1	3	16	1.7
180	x	x	1	x	2	x	4	7	0.7
190	x	x	1	8	5	1	3	18	1.9
200	x	x	x	2	x	1	4	7	0.7
210	x	x	x	x	2	1	1	4	0.4
330	x	x	x	x	x	x	1	1	0.1
Total	59	83	148	164	226	96	175	951	100.0

Source: author's calculations following the STSA data (2001 – 2007)

Table 10

Average capacity of the registered tractors (HP) by years depending on age (2001–2007)

Age of registered tractors	2001			2007		
	Number	Average capacity, HP	Capacity total, HP	Number	Average capacity, HP	Capacity total, HP
0 and 1 year	60	75	4500	175	108	18900
2 years	4	91	364	10	111	1110
3 years	16	88	1408	4	110	440
4 years	12	85	1020	12	88	1056
5 years	9	72	648	8	72	576
6 years	35	41	1435	10	84	840
7 years and more	1831	57	104367	775	61	44225
Total	1967	58	113742	994	68	67147
Total average capacity per 1000 ha of AL	x	x	294.7	x	x	166.4

Source: author's calculations following the data from STSA (2001 – 2007)

Conclusions

1. In Vidzeme region economically active rural farms/holdings manage 29.9% of the total utilised agricultural area in Latvia; and they are mainly doing crop cultivation and cattle breeding.
2. Technical provision of Vidzeme region economically active rural farms per 1000 ha of agricultural land in the period from 2001 to 2007 shows a rise in provision of wheel tractors by 6.9% and for tractor trailers – by 12.5%.
3. Tractor fleet in rural farms is gradually getting older because most of the holdings are not able to renovate their tractor fleet with newer tractors as a result of economic situation.
4. The number of tractors registered in the State Technical Supervision Agency in the period of 2001–2007 has increased by 6.1%, but the number of tractors that have passed roadworthiness test has decreased by 7.3%. Increase in the number of non-used tractors and technically not ready for exploitation tractors negatively influences the dynamics of specific weight of tractors that have passed roadworthiness tests.
5. The comparison of provision of wheel tractors per agricultural land in the period of 2001–2007 shows that the specific weight of tractors with capacity of 60–100 kW has increased by 4.3%, but over 100 kW – by 3.4%. Specific weight of the number of tractors with capacities less than 40 kW – 60 kW has decreased because it is not economically efficient to use them for production and management of large land areas.
6. In the period of 2001 – 2007 the biggest specific weight of new acquired tractors is for 80 Hp tractors – 26.3%, for 90 HP tractors – 18.6%, and for 110 HP tractors – 11.1%.
7. The average capacity of registered tractors calculating per 1000 ha of agricultural land has decreased from 294.7 HP in 2001 to 166.4 HP in 2007. It is because economically active farms have stabilised their operation and they do not see any chance to purchase new tractors in the present economic situation without any possibilities to extend their land areas.

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Kopsavilkums

Darbā raksturota Vidzemes reģiona ekonomiski aktīvo lauku saimniecību (2001.–2007.) skaita un lieluma dinamika, sējumu platību izmaiņu dinamika, lauksaimniecības tehnikas vienību skaita attīstība. Veikts pētījums par lauksaimniecības tehnikas nodrošinājumu uz lauksaimniecībā izmantojamo zemi Vidzemes reģiona ekonomiski aktīvajās lauku saimniecībās, apskatīta traktoru vecuma īpatsvara struktūra, novērtēts tehnisko apskati izgājušo traktoru īpatsvars un nodrošinājums uz lauksaimniecībā izmantojamo zemi, analizēta neizmantoto traktoru skaita dinamika, reģistrēto traktoru vidējās jaudas un to nodrošinājums uz lauksaimniecībā izmantojamo zemi.

Atslēgas vārdi
Lauksaimniecības tehnika, nodrošinājums, saimniecība.

Izglītības sistēma - uzkrātā neefektivitāte un ekonomiskā krīze
System of Education – Accumulated Inefficiency and Economic Crisis

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Abstract
Current economic and financial situation in Latvia demands decisive improvement of both public sector administration and economic efficiency. Education is one of the sectors which efficiency has to be improved according to the reports of international financial and consulting organisations. The article deals with the opportunities of creating more efficient secondary school network.
Key words: secondary school, secondary school pupil, region, reorganisation, distance.

Ievads

2009. gadā sabiedrība arvien sāpīgāk izjūt Latvijas ekonomikas „cieto piezemēšanos", kas izpaužas ekonomiskā recesijā un finanšu krīzē. Recesiju Latvijā diemžēl pastiprina pasaules ekonomikas un finanšu krīze, kā arī finansiālās problēmas, kuras radījusi Parex bankas pārņemšana. Galvenie ekonomikas pārkaršanas cēloņi bija ar produktivitātes pieaugumu nesaistītais pārspīlētais algu un štata vietu kāpums publiskajā sektorā, kā arī liels komercbanku izsniegto privāto kredītu apjoms, kas galvenokārt tika izmantots hipotekāros darījumos un patēriņam. Šobrīd valdības rīcība *de facto* ir reglamentēta ar starptautiskajām organizācijām (Starptautisko Valūtas fondu un Eiropas Savienību) parakstītajos līgumos. Šajā neordinārajā situācijā Saeima un valdība ir rīkojusies radikāli, 2009. gadā būtiski samazinot publiskā sektora izdevumus. Taču fiskālās tendences liecina, ka tuvākajā laikā ir jāveic ievērojami strukturāli pārkārtojumi ne tikai valsts pārvaldē, bet arī atsevišķos tās sektoros, piemēram, izglītībā un veselības aprūpē, lai paaugstinātu šo sektoru ekonomisko efektivitāti, uzlabotu pakalpojumu kvalitāti. Recesijas laikā tas ir sarežģīts, taču absolūti nepieciešams uzdevums. Rakstā apskatīti iespējamie ekonomiskās efektivitātes paaugstināšanas varianti vispārējās vidējās izglītības posmā.

Atslēgas vārdi: vidusskola, vidusskolēns, novads, reorganizācija, attālums.

Starptautiskās donoru un finanšu organizācijas jau kopš Latvijas iestāšanās dokumentu ratifikācijas ir veikušas pētījumus dažādos tautsaimniecības sektoros un norādījušas uz to zemo ekonomisko efektivitāti (piemēram, Pasaules Bankas ieteiktais Ambulatorās un stacionārās veselības aprūpes pakalpojumu sniedzēju struktūras plāns (tā sauktais māsterplāns), OECD veiktais projekts „Valsts izglītības politikas analīze – Latvija" (Valsts… 2000). Arī jaunākais Pasaules Bankas un Starptautiskā Valūtas fonda 2007.gada 11. – 22.jūnija tehniskās palīdzības misijas ziņojums (kurš tika padarīts par slepenu), norāda uz izglītības sektora zemo ekonomisko efektivitāti.

Latvijā ir bijis arī daudz iekšēju diskusiju par izglītības sistēmas ekonomisko efektivitāti. Detalizētāk šie jautājumi ir analizēti LR IZM finansētā projekta "Latvijas izglītības sistēmas ekonomiskās efektivitātes paaugstināšanas aspekti" pētījumā „Vispārējās izglītības iestāžu tīkla racionalizācijas iespējas Latvijā" (Eglītis 2008), kuru veica Daugavpils Universitātes Sociālo pētījumu institūts. Viens no galvenajiem ekonomiskās efektivitātes rādītājiem ir skolotāja – skolēna attiecība (1. tabula). Latvijas rādītājs ir otrs zemākais aiz Lietuvas rādītāja, un tas ir zemāks nekā valstīs ar ievērojami mazāku iedzīvotāju blīvumu (Somija un Zviedrija). Kopumā aplūkotajām ES dalībvalstīm raksturīga šī rādītāja samazināšanās, kas varētu būt izskaidrojama ar demogrāfiskās situācijas pasliktināšanos. Savukārt Igaunijā ISCED 2 un ISCED 3 līmenī šis rādītājs ir pieaudzis, kas liecina par to, ka ekonomisko efektivitāti paaugstinošas reformas ir jau paveiktas. Diemžēl nav pieejami salīdzinoši jauni dati par citu rādītāju – skolēnu skaitu klasē un skolēnu skaitu skolā.

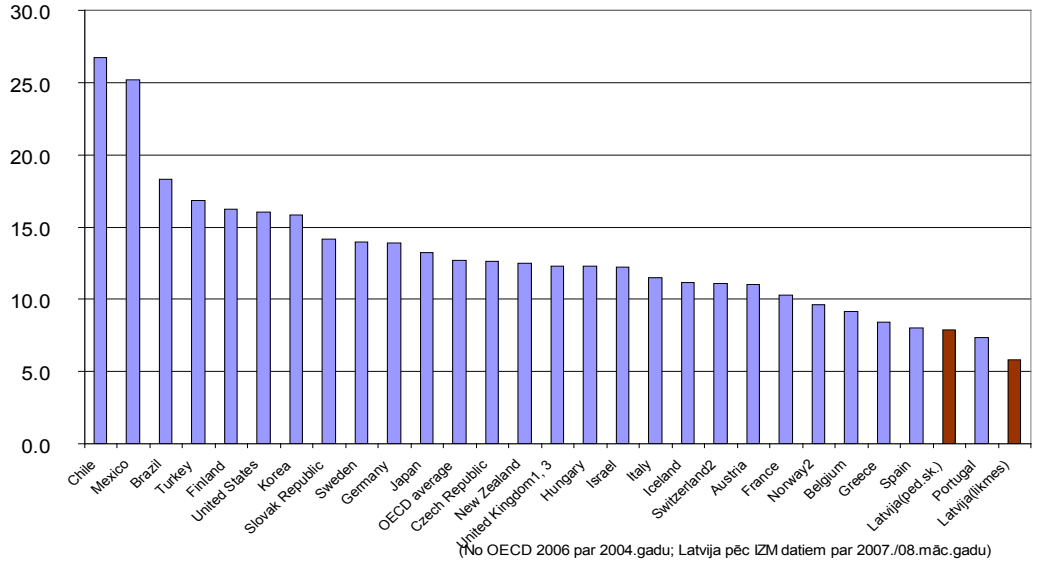
Ministru kabineta 2008.gada 15.janvāra sēdē (protokols Nr.3 51.§) tika izskatīts Izglītības un zinātnes ministrijas sagatavotais „Informatīvais ziņojums par Pasaules Bankas un Starptautiskā Valūtas fonda tehniskās palīdzības 2007.gada 11. – 22.jūnija misijas sniegtā situācijas raksturojuma izglītības nozarē detalizētu analīzi un iespējām īstenot misijas ieteikumus". IZM tika uzdots (prot. Nr.3 51. §, 2.punkts) sadarbībā ar Reģionālās attīstības un pašvaldību lietu ministriju (turpmāk – RAPLM) izveidot darba grupu, lai izstrādātu priekšlikumus izglītības iestāžu tīkla attīstībai. Darba grupas informatīvā ziņojuma „Par priekšlikumiem

1. tabula

Skolotāja/skolēna attiecība pa izglītības līmeņiem
Pupil/teacher ratio by ISCED levels

	ISCED 1-3	ISCED 1		ISCED 2		ISCED 3	
	2006	2000	2006	2000	2006	2000	2006
Dānija	11.4	10,7	-	10,6	11.4	12,1	-
Somija	13.7	16,9	15.0	10,7	9.7	17,0	15.8
Zviedrija	12.4	12,8	12.1	12,8	11.4	15,2	13.8
Īrija	16.9	21,5	19.4	15,8		15,8	14.6
Čehija	13.4	21,0	17.3	15,6	12.3	13,4	11.9
Polija	12.1	12,7	11.4	11,5	12.6	16,9	12.7
Slovēnija	12.9	13,4	14.9	13,8	10.2	13,1	14.0
Slovākija	14.9	18,3	18.6	13,5	13.7	12,8	14.2
Igaunija	13.3	15,0	14.1	11,2	12.3	10,1	13.3
Latvija	11.2	18,0	11.8	12,7	10.5	13,3	11.7
Lietuva	9.0	16,7	10.7	11,4	8.5	-	-

Avots: Eurostat Yearbook un Eurostat



1. attēls. **Skolotāju un skolēnu skaita attiecība**
Pupil and teacher ratio

izglītības iestāžu tīkla attīstībai" secinājumi sakrīt ar iepriekš rakstīto (1. attēls). Ziņojumā teikts: „Dati liecina, ka sākumskolās uz vienu skolēnu gadā tiek tērēts visvairāk budžeta līdzekļu. Vērojama tendence – jo vairāk skolēnu skolā un lielāka skola, jo mazāk līdzekļu jāiegulda uz vienu skolēnu. Tas raksturo finanšu līdzekļu efektivitāti lielās skolās".

Igaunijā vispārizglītojošo vidusskolu klasēs noteiktais minimālais skolēnu skaits ir 21 (finansējuma apjoms ir atkarīgs no tālākā skolēnu skaita). Latvijā normatīvie akti nosaka ievērojami liberālākas prasības – MK noteikumi Nr. 735 „Noteikumi par minimālo un maksimālo izglītojamo skaitu valsts un pašvaldību vispārējās izglītības iestādes klasēs, pirmsskolas izglītības iestādes grupās, speciālās izglītības iestādēs un sociālās un pedagoģiskās korekcijas klasēs" nosaka:

„10. Vispārējās vidējās izglītības programmas apguvei vienā klasē pieļaujamais izglītojamo skaits ir šāds:

10.1. republikas pilsētās un rajonu centros – 22–30;

10.2. pārējās apdzīvotās vietās – 12–30;"

Tādējādi ekonomiskās efektivitātes paaugstināšanas nepieciešamību atzīst gan ārzemju, gan pašmāju eksperti, piemēri ir aprobēti arī kaimiņvalstīs.

Kādi ir iespējamie IZM rīcības varianti? Teorētiski rīcības spektrs ir ļoti plašs – no vienkāršiem grozījumiem normatīvajos aktos līdz kompleksu programmu izstrādei un realizācijai. Visātrākais un efektīvākais risinājums būtu grozījums iepriekšminēto MK noteikumu Nr. 735 punktā 10.2., izsakot to šādā redakcijā „pārējās apdzīvotās vietās – 22–30". Tas nozīmētu, ka visu valsts vispārizglītojošo vidusskolu 10. -12. klasēs (turpmāk vidusskolās) minimālais skolēnu skaits ir vienāds un tie ir 22 skolēni klasē. Šo grozījumu ietekme uz vidusskolu tīklu analizēta nākamajā sadaļā. Tādējādi novadu pašvaldībām jāizvērtē gan transporta pakalpojumu grafiks, gan dienesta viesnīcu pieejamība lielākajās vidusskolās. Kompleksāki risinājumi (valsts ģimnāziju tīkla attīstīšana) ir analizēti autora iepriekšējās publikācijās (Eglītis 2001; Eglītis, Rivža B., Rivža P. 2003), taču to realizācijai ir vajadzīgi finanšu un laika resursi, kādu šobrīd nav valdības rīcībā.

Kāpēc tieši tagad jārunā par skolu tīkla racionalizāciju? Raksta sākumā jau ir minēta sarežģītā ekonomiskā situācija, kas liek vēl vairāk samazināt budžeta izdevumus laikā, kad faktiski ir iesaldēts un pat tiek samazināts pedagogu atalgojuma apmērs (šobrīd tas skar 10% piemaksu par darba kvalitāti). Neveicot ekonomiskās efektivitātes paaugstināšanas pasākumus, jau 2009./2010. mācību gadā var nākties atteikties no valsts finansētās interešu izglītības, kas ir bijusi ļoti nozīmīgs sociāls un kultūras faktors jaunatnes audzināšanā, un tālākā perspektīvā arī no bezmaksas vispārējās vidējās izglītības. Bez tam ir pieņemti visi nepieciešamie normatīvie akti, lai pabeigtu administratīvi teritoriālo reformu (ATR), 2008. gada 30. decembrī ir izsludināts „Administratīvo teritoriju un apdzīvoto vietu likums". Arī Satversmes tiesas lēmumi par dažu pašvaldību iesniegumiem, kas apstrīdēja ATR, liek domāt, ka 2009. gada 6. jūnijā pašvaldību vēlēšanas notiks jaunajās administratīvajās teritorijās – novados. ATR realizācijas laikā (apmēram 15 gadu garumā) tās koncepcijās un pamatpieņēmumos ir notikusi būtiska ideju evolūcija. Iepriekšējos reformas kritērijos bija atsauces uz vidusskolu lielumu, un tika veikta arī eventuālā vidusskolu tīkla analīze (Eglītis 2002), savukārt pēdējos skaidrojumos, kas atrodami Reģionālās un pašvaldību lietu ministrijas mājas lapā (http://www.raplm.gov.lv/pub/index.php?id=1036), izglītības kritēriju faktiski nav:

1. *Veidojot novadus tiek ņemti vērā šādi novadu veidošanas nosacījumi:*
   - *ir nodrošināta novada teritorijas ilglaicīga un līdzsvarota attīstība;*
   - *ir novadu pašvaldības funkciju veikšanai nepieciešamā infrastruktūra;*
   - *novada teritorijas lielums;*
   - *pastāvīgo iedzīvotāju skaits novada teritorijā;*
   - *pastāvīgo iedzīvotāju blīvums novada teritorijā;*
   - *novada pašvaldības sniegto pakalpojumu sasniedzamība;*
   - *novadu veidojošo vietējo pašvaldību ekonomiskā, ģeogrāfiskā un vēsturiskā vienotība;*
   - *ir nodrošināta optimāla novada pašvaldības teritorijas izveidošana, ņemot vērā blakusesošo novadu pašvaldību intereses.*

2. Administratīvi teritoriālās reformas mērķis ir izveidot ekonomiski attīstīties spējīgas administratīvās teritorijas (novadus) ar vietējām pašvaldībām, kas nodrošinātu kvalitatīvu pakalpojumu sniegšanu iedzīvotājiem. Novads izveidojas apvienojoties pagastiem, pilsētām vai pagastiem un pilsētām, novadā ir viena vietējā pašvaldība. Novadā apvienotie novada pagasti un novada pilsētas saglabā pirms apvienošanās esošo nosaukumu un teritoriju.

Izveidojot novadus tās pašvaldības, kurās nav pieejami kvalificēti speciālisti, varēs piesaistīt juristus, ekonomistus, finansistus, personāla speciālistus, teritorijas un attīstības plānotājus, projektu vadītājus un sociālos darbiniekus. Būs iespējams uzlabot iedzīvotājiem sniedzamos pakalpojumus tādās jomās, kā izglītība, sociālā palīdzība, kultūra, ekonomika.

Izglītība. Izglītības jomā novadi varēs nodrošināt konkurētspējīgāku izglītību, jo spēs piesaistīt vairāk kvalificētus skolotājus un nodrošināt labāku skolu materiālo bāzi. Palielināsies iespējas vispusīgai interešu izglītībai - sporta skolu, mūzikas skolu, mākslas skolu utt. pieejamībai novadā (http://www.raplm.gov.lv/pub/index.php?id=38).

Tas nozīmē, ka jaunās, lielākās novadu pašvaldības ir brīvas izglītības jautājumu risināšanā, ciktāl to nereglamentē normatīvie akti. Pašvaldību interesēs līdztekus kvalitātes un pieejamības jautājumiem svarīgi ir arī ekonomikas un fiskālie jautājumi – iespējami vairāk valsts budžeta finansētu darba vietu (vairāk nodokļu pašvaldības budžetā) un iespējami mazāk maksājumu savstarpējos norēķinos ar citām pašvaldībām. *De facto* tas nozīmē skolu saglabāšanu pašvaldībā par jebkuru cenu.

Taču, kā jau minēts, ekonomiskās un finanšu situācijas kontekstā valstij ir jāpaaugstina ekonomiskā efektivitāte, kas nozīmē racionālāku līdzekļu izlietošanu. Tāpēc iespējamo reformu kontekstā detalizētāk tiks analizēts vispārizglītojošās vidusskolas 10.-12.klašu posms. Pamatjautājums

nepārprotami ir viens - vidusskolu tīkla racionalizācija (mazu vidusskolu reorganizāciju par pamatskolām), un tas skatāms dažādos aspektos:

1. *Skolēnu sadale starp vispārējās vidējās izglītības programmām (VVIP) un vidējās profesionālās izglītības programmām (VPIP)*

Šobrīd to pamatskolu absolventu daļa, kas izvēlas VVIP programmas, ir ievērojami lielāka nekā tā, kas izvēlas VPIP, turklāt šī attiecība ir viena no radikālākajām ES. Jautājums ir detalizēti skatīts autora iepriekšējās publikācijās (Eglītis, Jermolajeva 2006). Galvenie argumenti pašreizējās proporcijas saglabāšanai:

- augstskolu studentu absolūti lielāko daļu veido tieši VVIP absolventi, un zināšanu ekonomikas kontekstā tas ir ļoti nozīmīgi,
- VVIP ir daudz pieejamākas nekā VPIP,
- neskaidrā situācija darba tirgū, kas pamatskolu beidzēju profesijas izvēli padara sarežģītu,
- VPIP materiālās bāzes kvalitāte,
- demokrātiskā sabiedrībā un brīvā tirgus ekonomikā aizliegumi un limiti nav pozitīvi vērtējami.

Galvenie argumenti proporcijas izmaiņām par labu VPIP:

- VPIP materiālā bāze pēdējo gadu laikā būtiski uzlabojusies,
- VVIP centralizēto eksāmenu rezultāti liecina, ka salīdzinoši lielai vidusskolēnu daļai VVIP ir pārāk sarežģīta (centralizēto eksāmenu rezultāti VPIP ir vēl sliktāki, taču šo programmu absolventu tuvākais mērķis ir darba tirgus),
- esošais vidusskolēnu sadalījums starp VVIP un VPIP ir viens no radikālākajiem ES,
- demokrātiskā sabiedrībā un brīvā tirgus ekonomikā viena no valsts ekonomiskās regulēšanas metodēm ir valsts pasūtījums.

Izvērtējot ekonomiskās efektivitātes regulācijas iespējas, kā viens no risinājumiem varētu būt stingrāki noteikumi VVIP klašu atvēršanai (minimālajam skolēnu skaitam klasē un minimālajam skolēnu skaitam vidusskolā).

2. Izglītības kvalitāte

Centralizēto eksāmenu (Eglītis 2003) un starptautisko pētījumu rezultāti liecina, ka rezultāti lielākās klasēs un skolās ir augstāki. Piemēram, 2008. gadā centralizētajos eksāmenos vērtējums trīs augstākajos līmeņos (A, B, C) bija 89.8% no valsts ģimnāzijās kārtotājiem eksāmeniem, 62.7% no vidusskolās un ģimnāzijās kārtotajiem eksāmeniem (attiecīgi 25.6% vakarskolās, 25.0% tehnikumos un koledžās, 13.0% arodskolās). Valsts ģimnāziju izveides mērķi bija resursu koncentrēšana un izglītības kvalitātes paaugstināšana. Arī IZM informatīvajā ziņojumā „Par priekšlikumiem izglītības iestāžu tīkla attīstībai" secināts: „Vienlaikus ir vērojama tendence, ka šajās (lielajās – autora paskaidrojums) skolās ir augstāka izglītības kvalitāte, jo lielais skolēnu skaits nodrošina vairāku klašu komplektu veidošanos, kā rezultātā skolotājiem ir pietiekami liela darba slodze, atbilstošs atalgojums. Šo faktoru kopums ļauj lielajām skolām piesaistīt zinošākus un prasmīgākus pedagogus."

Dabas zinību mācīšanas kontekstā svarīga ir arī moderni aprīkotu mācību laboratoriju un kabinetu iekārtošana, bet IZM administrētās ES programmas neparedz visu vidusskolu aprīkošanu no ES un valsts budžeta līdzekļiem. Rodas jautājums par vienotu VVIP kvalitātes nodrošināšanu, kas risināms VVIP programmu un skolu akreditācijas procesā.

Izvērtējot izglītības kvalitātes nodrošināšanas iespējas, kā risinājums varētu būt prasības mācību materiālās bāze nodrošināšanai VVIP, kā arī centralizēto eksāmenu ieviešana pamatskolas 9. klasē un kvalitātes prasības (noteikts nepieciešamais eksāmena vērtējuma minimums) izglītības turpināšanai VVIP.

3. Pieejamība

Jautājums ir detalizēti aplūkots autora iepriekšējās publikācijās (Eglītis 2003), kur ir konstatēts, ka notiek būtiska vidusskolēnu migrācija uz Rīgu un rajonu pilsētām. Tas liecina, ka vidusskolēni jau ir pietiekami mobili, tomēr ir nepieciešamas alternatīvas Rīgai un citām valsts nozīmes pilsētām, stiprinot vidusskolas (veidojot valsts ģimnāzijas, stimulējot dienesta viesnīcu izveidi) arī citos novadu centros, kuros vidusskolai ir perspektīva (Eglītis 2002, 2003). Protams, mazo vidusskolu reorganizācija daļai vidusskolēnu radīs nepieciešamību veikt lielākus attālumus nekā šobrīd, taču tas ir jākompensē ar labāku izglītības kvalitāti un labiem sadzīves apstākļiem. **Izvērtējot izglītības pieejamības saglabāšanas iespējas, kā risinājums varētu būt valsts ģimnāziju tīkla veidošana, programma jaunu dienesta viesnīcu izveidei un esošo uzlabošanai.**

4. Sociālie faktori

Parasti kā pretargumenti skolu tīkla racionalizācijai tiek minēti dažādi sociālie faktori - nepietiekamais finansiālais nodrošinājums, attālums, citas lauku sociālās problēmas. Taču rodas dilemma par vērtībām - no vienas puses izglītības kvalitāte un skolēna nākotnes iespējas, no otras - daļēji pamatotas, taču bieži vien pārspīlētas sociālās problēmas. Autora pieredze izglītības iestādes vadītāja darbā Preiļu Valsts ģimnāzijā (1996.-2003.gads) liecina, ka kvalitatīvas izglītības un skolēnam pretimnākošas sociālās vides (tai skaitā bezmaksas dienesta viesnīcas iespējas) piedāvājums, pašvaldības atbalsts (piemēram, transporta izdevumu daļēja apmaksa) un paša skolēna motivācija dod iespēju ne tikai pārvarēt sociālās problēmas, bet arī iegūt konkurētspējīgu izglītību kā

nākotnes kapitālu. Lauku sociālo problēmu pamatā ir neefektīvs ekonomiskās saimniekošanas modelis un mazo lauku vidusskolu pastāvēšana nebūt nav faktors, kurš to mainīs.

5. Ekonomiskā efektivitāte

Ekonomiskās efektivitātes jautājums ir detalizētāk skatīts iepriekšējās autora publikācijās (Eglītis, Jermolajeva 2006; Eglītis 2008), tāpēc tiks analizēts tikai viens aspekts – vidusskolēnu skaits vidusskolā. Igaunijā vidusskolu klasēs noteiktais minimālais skolēnu skaits ir 21. Kā jau minēts, Latvijā šie skaitļi ir attiecīgi 12 un 22. Ekonomiskās un finanšu krīzes apstākļos šo modeli vairs nav iespējams saglabāt. Tāpēc aplūkosim divas alternatīvas Latvijas novadu vidusskolu tīkla perspektīvas: **liberālo variantu** - daļēji pārņemot Igaunijas pieredzi (22 skolēni vidusskolas klasē, vismaz 66 vidusskolā visā valsts teritorijā), vai izvirzot **radikālo variantu** - prasību pēc vismaz divām paralēlklasēm vidusskolā (vismaz 132 skolēni vidusskolā). Kā varētu mainīties vidusskolu tīkls katrā no piedāvātajiem variantiem, ņemot vērā tikai vidusskolēnu (turpmāk tekstā *skolēni*) skaita, vidusskolu un attāluma faktorus (tabulās *vidusskolas* vietā lietota abreviatūra *vsk*)?

ATR rezultātā ir izveidojušās platības, iedzīvotāju skaita, administratīvā centra un infrastruktūras ziņā ļoti atšķirīgas pašvaldības, kuras atkarībā no vidusskolu infrastruktūras var iedalīt vairākās grupās:

2. tabula

Rajonu centru un tiem līdzīgie novadi
District centres and municipalities similar to district centres

Novads	Skolēnu skaits	to skaitā ar krievu mācību valodu	Vidusskolu skaits	to skaitā ar mazu skolēnu skaitu	Attālums no novada centra līdz vidusskolai ar mazu skolēnu skaitu, km
Aizkraukles	380	60	2		
Alūksnes	446		3	1	Liepnas vsk. 33
Balvu	481	17	5	1	Bērzpils vsk. 36
Bauskas	664		5	1	Mežotnes vsk. 11
Cēsu	863	49	3		
Dobeles	637		3		
Gulbenes	665		6	2	Gulbīšu vsk. 16 Lejasciema vsk. 28
Krāslavas	364	129	3	1	Indras vsk. 31
Kuldīgas	559		4		
Limbažu	517		3		
Līvānu	311	68	3	1	Rudzātu vsk. 23
Ludzas	386	83	3	1	Istras vsk. 51
Madonas	774		4	1	Ļaudonas vsk. 25
Ogres	727	86	6	2	Madlienas vsk. 39 Taurupes vsk. - Ērgļi 20
Preiļu	478		2		
Saldus	761		5	2	Kalnu vsk. 53 Ezeres vsk. 33
Siguldas	510		2		
Smiltenes	355		2		
Talsu	854		6	3	Sabiles vsk. 24 Vandzenes vsk. 17
Tukuma	687	28	7	4	Džūkstes vsk. 30 Irlavas vsk. 19 Tumes vsk. 6
Valkas	177		2		

Avots: Autora apkopojums.

3. tabula

Novadi, kuros vidusskolas atrodas tikai novada centrā un vidusskolēnu skaits ir pietiekams trim pilnām vidusskolas klasēm
Municipalities with a secondary school located only in the centre of the municipality

Novads	Vidusskolēnu skaits	tai skaitā ar krievu mācību valodu	Vidusskolu skaits	tai skaitā ar mazu skolēnu skaitu	Attālums no novada centra līdz tuvākajai lielajai vidusskolai, km
Ādažu	203		2*	1*	
Aizputes	177		1		
Aknīstes	102		1		Jēkabpils 41
Babītes	79		1		**
Baldones	112		1		**
Brocēnu	163	25	1		
Cesvaines	109		1		Madona 17
Dundagas	133		1		
Ērgļu	83		1		Koknese 38
Grobiņas	207		2	1	
Iecavas	200		1		
Ikšķiles	122		1		Ogre 8
Jaunjelgavas	66		1		Aizkraukle 15
Kandavas	153		2		
Kārsavas	67		1		Ludza 28
Kokneses	142		1		
Krimuldas	78		1		**
Ķeguma	119		1		Lielvārde 6
Lubānas	82		1		Madona 41
Mālpils	73		1		Sigulda 21
Mārupes	131		1		**
Mazsalacas	68		1		Rūjiena 22
Naukšēnu	87		1		Rūjiena 8
Neretas	75		1		Aizkraukle 53
Nīcas	80		1		Liepāja 16
Olaines	231	117	2		
Ozolnieku	87		1		Jelgava 6
Pļaviņu	131	12	1		Jēkabpils 22
Priekules	108		1		Grobiņa 30
Priekuļu	116		1		Cēsis 5
Ropažu	68		1		**
Rundāles	67		1		Bauska 12
Rūjienas	137		1		
Salaspils	215	88	2		
Sējas ***	154		1		
Skrīveru	177		1		
Skrundas	79		1		Saldus 30
Varakļānu	99		1		Rēzekne 48

3. tabulas turpinājums

Novads	Vidusskolēnu skaits	tai skaitā ar krievu mācību valodu	Vidusskolu skaits	tai skaitā ar mazu skolēnu skaitu	Attālums no novada centra līdz tuvākajai lielajai vidusskolai, km
Viesītes	97		1		Jēkabpils 28
Viļānu	131	41	1		Preiļi 36
Zilupes	103	41	1		Ludza 34

Avots: Autora apkopojums.

* viena privātskola

** Rīgas rajons

*** Murjāņu sporta ģimnāzijas liktenis ir neskaidrs

1. Novadi, kuros nav vidusskolas

Valstī pavisam ir seši novadi Beverīnas, Carnikavas, Durbes, Garkalnes, Rucavas un Valmieras, kuros nav vidusskolas. Visticamāk vidusskola tajos arī netiks izveidota un šo novadu pamatskolu absolventi apmeklē blakus pašvaldību vidusskolas.

2. Valsts nozīmes pilsētu pašvaldības

Valsts nozīmes pilsētu pašvaldībās (Daugavpils, Jelgava, Jēkabpils, Jūrmala, Liepāja, Rīga, Rēzekne, Valmiera, Ventspils) skolēnu skaits ir pietiekami liels, un tajās nav problēmu realizēt arī radikālo variantu. Lielā skolēnu skaita dēļ problēmu nebūtu, arī ievērojot apmācību valodas faktoru. **Ekonomiskās efektivitātes paaugstināšanas iespēja – minimālais skolēnu skaits klasē - 24 skolēni vai prasība pēc 132 skolēniem vidusskolas posmā.**

3. Rajonu centru un tiem līdzīgie novadi

Šajā novadu grupā ietilpst bijušie rajona centri, kā arī novadi, kuros ir pēc iedzīvotāju skaita rajona centram līdzīga pilsēta (2. tabula). Šajā grupā no ekonomikas efektivitātes viedokļa problēmām nevajadzētu rasties ne liberālajā, ne radikālajā variantā, atliek vien ievērot stingrus finansējuma piešķiršanas kritērijus (jau pieminētie 22 skolēni vidusskolas klasē) novadam kopumā. Skolēni, kuri apgūst VVIP mazākumtautību valodā, ir astoņos novados. Perspektīvā šis skaits varētu samazināties, tomēr uz šo gadījumu nebūtu attiecināma prasība pēc divām paralēlklasēm radikālajā variantā, ja vien ir pietiekams kopējais skolēnu skaits novadā. Skolēnu, vidusskolu un attāluma rādītāji apkopoti 2. tabulā, par vidusskolu ar mazu skolēnu skaitu uzskatāma skola, kurā 10.-12. klasēs ir mazāk par 66 skolēniem (trīs klases pa 22 skolēniem katrā). Attālumi starp apdzīvoto vietu centriem noteikti, izmantojot *Google map* datorprogrammu ,un tie var nedaudz atšķirties no faktiskajiem attālumiem starp skolām.

Viskompaktāk vidusskolas izveidotas Cēsīs (tur arī skaitliski vislielākais vidusskolēnu skaits), Preiļos, Siguldā un Smiltenē, savukārt Talsu un Tukuma rajonā ir attiecīgi 6 un 7 vidusskolas. Iespējamā skolu tīkla racionalizācija liberālajā variantā skartu relatīvi nelielu skolu skaitu (apmēram 19). Taču aptuveni sešām mazajām vidusskolām attālums līdz novada centram ir lielāks par 30 kilometriem, un šajos gadījumos ir divas iespējas: dienesta viesnīcas pieejamība novada centrā vai atsevišķos gadījumos īpaši nosacījumi, kas ļauj atvērt klasi ar mazāku skolēnu skaitu. Radikālajā variantā reorganizēto vidusskolu skaits būtu lielāks, taču tas skatāms katra novada un pilsētas kontekstā. **Šādos novados racionāli būtu 1-3 vidusskolas. Ekonomiskās efektivitātes paaugstināšanas iespēja – minimālais skolēnu skaits klasē - 22 skolēni, mazo lauku vidusskolu reorganizācija par pamatskolām, finansējuma piešķiršana uz novada vidusskolēnu kopējo skaitu.**

4. Novadi, kuros vidusskolas atrodas tikai novada centrā un vidusskolēnu skaits ir pietiekams trim pilnām vidusskolas klasēm

Šī ir vislielākā novadu grupa un reformas liberālajā variantā pārmaiņu varētu būt vismazāk. Tomēr jāņem vērā, ka demogrāfiskās situācijas dēļ skolēnu skaits samazinās un šāds *status quo* nebūs ilgi.

Divas vidusskolas ir Ādažu (1 – privāta), Grobiņas, Kandavas, Olaines un Salaspils novadā, turklāt tikai Olainē un Salaspilī tas saistīts ar mācību valodas faktoru. Vairākos novados vidusskolēnu skaits tikai nedaudz pārsniedz 66, tādējādi liberālajā reformas variantā vidusskolas reorganizācija iespējama jau tuvākajos gados (Jaunjelgava, Mazsalaca, Ropaži, Skrunda). Radikālajā variantā reorganizējamas apmēram 28 vidusskolas, taču šajā gadījumā migrācijas un centrtieces tendences ievērojami pastiprināsies (īpaši, Rīgas rajonā), vairākos gadījumos attālumi līdz lielajām vidusskolām ir lieli, un tas var radīt nopietnas problēmas. **Šādos novados racionāli būtu 1 vidusskola (izņemot Olaini un Salaspili). Ekonomiskās efektivitātes paaugstināšanas**

iespēja – minimālais skolēnu skaits klasē - 22 skolēni, finansējuma piešķiršana uz novada vidusskolēnu kopējo skaitu.

5. Novadi, kuros vidusskola ir vairākās apdzīvotās vietās un skolēnu skaits pārsniedz mazai vidusskolai nepieciešamo (66 skolēni)

Šī varētu būt visproblemātiskākā novadu grupa, jo, kaut arī vidusskolēnu skaits novadā pārsniedz 66, tas ļoti bieži sadalās pa divām vai vairāk skolām un rodas jautājums par resursu koncentrēšanu. Ir izdalāmas vairākas novadu grupas (4. tabula):

1. Novadi, kuri veidojušies ap valsts nozīmes pilsētām (Daugavpils, Jelgavas, Rēzeknes) un kuros ir liels mazu vidusskolu, kas izkliedētas plašā teritorijā, skaits. Liberālajā variantā šajos novados kopējais vidusskolu skaits varētu samazināties no 20 uz 10, kas vienlaikus nodrošinātu arī radikālā varianta nosacījumu izpildi, tomēr ceļu tīkla dēļ visticamāk būtu sarežģīti izveidot kopumā 2-5 spēcīgas vidusskolas (kas faktiski nozīmē gandrīz 15 vidusskolu reorganizāciju) un skolēni radikālajā variantā būtu spiesti braukt uz valsts nozīmes pilsētu. Šajā gadījumā Daugavpilī, Rēzeknē un Jelgavā

4. tabula

Novadi, kuros vidusskola ir vairākās apdzīvotās vietās un skolēnu skaits pārsniedz mazai vidusskolai nepieciešamo (66 skolēni)
Municipalities with secondary schools located in several places

Novads	Skolēnu skaits	to skaitā ar krievu mācību valodu	Vidusskolu skaits	to skaitā ar mazu skolēnu skaitu	Attālums starp vidusskolām (ja tās atrodas dažādās apdzīvotās vietās), km	Attālums no novada centra līdz tuvākajai lielajai vidusskolai, km
Aglonas	94		2	2	4	Preiļi 28
Alojas	88		2	2	12	Limbaži 33
Apes	77		2	2	34	Ape – Alūksne 29 Gaujiena – Smiltene 39
Auces	176		2	1	11	Auce – Dobele 41 Bēne – Dobele 30
Dagdas	274	59	3	1	13	
Daugavpils	341	121	7	6	*	
Ilūkstes	259		3	2	15	
Ķekavas	109		2	1	?	
Jelgavas	254		5	5	*	
Lielvārdes	159		2	1	17	
Rēzeknes	521	118	8	3	*	
Rojas	133		2	1	27	
Salacgrīvas	152		2	1	34	Liepupe – Limbaži 23
Saulkrastu	162		2		6	
Strenču	69	27	2	2	5	Strenči – Valmiera 18
Vecpiebalgas	144		2	1	18	
Vecumnieku	230		4	2	Vecumnieki – Misa 9 Vecumnieki-Skaistkalne 26 Vecumnieki – Valle 18	
Ventspils	112		2	1	nav apskatāms	Piltene – Ventspils 22 Ugāle – Ventspils 35
Viļakas	142		2	1	18	

Avots: Autora apkopojums.

* nav attiecināms

5. tabula

Novadi, kuros ir mazas vidusskolas
Municipalities with a small number of pupils at the secondary level

Novads	Izglītības iestādes nosaukums	Mācību valoda	Vidusskolēnu skaits	Attālums līdz tuvākajai vsk, km
Alsungas	Alsungas vsk	latviešu	45	Kuldīga 29
Amatas	Nītaures vsk	latviešu	40	Mālpils 17
Baltinavas	Baltinavas vsk	latviešu	61	Kārsava 21
Burtnieku	Burtnieku vsk	latviešu	24	Valmiera 22
Ciblas	Ciblas vsk	latviešu	40	Ludza 12
Engures	Engures vsk	latviešu	59	Mērsrags 20 Tukums 22
Inčukalna	Vangažu vsk	krievu	38	Murjāņi 9
Jaunpiebalgas	Jaunpiebalgas vsk	latviešu	63	Vecpiebalga 22
Jaunpils	Jaunpils vsk	latviešu	56	Dobele 20
Jēkabpils	Zasas vsk	latviešu	59	Jēkabpils 33
Krustpils	Atašienes vsk	latviešu	36	Varakļāni 26
Līgatnes	Līgatnes vsk	latviešu	39	Sigulda 19
Pārgaujas	Stalbes vsk	latviešu	41	Cēsis 18
Pāvilostas	Pāvilostas vsk	latviešu	46	Liepāja 53
Raunas	Raunas vsk	latviešu	46	Priekuļi 16
Riebiņu	Riebiņu vsk	latviešu	49	Preiļi 7
Rugāju	Rugāju vsk	latviešu	45	Balvi 17
Salas	Salas vsk	latviešu	59	Jēkabpils 6
Stopiņu	Ulbrokas vsk	latviešu	60	Salaspils 12
Tērvetes	Augstkalnes vsk	latviešu	46	Dobele 18
Vaiņodes	Vaiņodes vsk	latviešu	61	Priekule 18
Vārkavas	Vārkavas vsk	latviešu	38	Preiļi 20

Avots: Autora apkopojums.

risināms arī dienesta viesnīcu jautājums. Taču no novadu, kuri ir relatīvi lieli un ar lielu iedzīvotāju skaitu, attīstības viedokļa svarīga būtu spēcīgāku vidusskolu izveide, nevis centrtieces faktoru veicināšana. Daugavpils un Rēzeknes novadā kā papildus sarežģītības faktors tīkla reorganizācijā ir mācību valoda.

2. Novadi, kuros viena nosacīti liela centra vidusskola vai liels centrs un izvēles situācija ir relatīvi vienkāršā – uz lielākās vidusskolas bāzes iespējams veidot ekonomiski efektīvāku vidusskolu (Auces, Dagdas, Ilūkstes, Vecumnieku). Liberālajā variantā tādējādi būtu iespējams reorganizēt apmēram 12 vidusskolas, savukārt radikālajā variantā būtu reorganizējamas vēl apmēram 10 vidusskolas. Atsevišķos gadījumos varētu būt īpaši nosacījumi, kas ļauj atvērt klasi ar mazāku skolēnu skaitu.

3. Novadi, kuros abas vidusskolas ir nelielas un līdzīgas – droši vien sarežģītāka izvēle par potenciālo vidusskolu (Aglonas, Alojas, Apes, Strenču). Liberālajā variantā iespējams reorganizēt apmēram 5 vidusskolas, radikālajā variantā reorganizējamas vēl apmēram 5 vidusskolas un tādējādi vidusskolu nebūtu vēl apmēram 5 novados. **Ekonomiskās efektivitātes paaugstināšanas iespēja – minimālais skolēnu skaits klasē - 22 skolēni, nelielo lauku vidusskolu reorganizācija par pamatskolām, finansējuma piešķiršana uz novada vidusskolēnu kopējo skaitu.**

4. Novadi, kuru vidusskolas klasēs skolēnu skaits ir mazāks nekā 66

Šajos novados ir viena vidusskola. Pat liberālajā variantā faktiskais jautājums ir par vidusskolas reorganizāciju, tādējādi vidusskolas nebūtu vēl 22 novados. Ņemot vērā iepriekšminētos kvantitatīvos

kritērijus, tas nenozīmē automātisku papildus klašu atvēršanu citās vidusskolās.

Mācību valodas faktors ir problemātisks Vangažu vidusskolas gadījumā, jo tuvumā nav citu vidusskolu ar krievu mācību valodu. Attālumi līdz tuvākajai lielajai vidusskolai vairumā gadījumu (izņemot Pāvilostu un Zasu) ir relatīvi nelieli un nevarētu radīt problēmas ikdienā, tādējādi atsevišķos gadījumos varētu būt īpaši nosacījumi, kas ļauj atvērt klasi ar mazāku skolēnu skaitu. **Ekonomiskās efektivitātes paaugstināšanas iespēja – minimālais skolēnu skaits klasē - 22 skolēni, nelielo lauku vidusskolu reorganizācija par pamatskolām.**

Priekšlikumi

1. Realizējot radikālo reformas variantu (minimālais skolēnu skaits vidusskolā ir 132), varētu tikt reorganizētas apmēram 90 vidusskolas, taču pašreizējā ekonomiskajā situācijā visticamāk nav iespējams ātri realizēt jautājumus, kas saistās ar kvalitatīvu dienesta viesnīcu izveidi. Radikālais variants var radīt politiskas problēmas, kas saistās ar jauno novadu attīstības perspektīvu pārskatīšanu un savstarpējo norēķinu apjoma pieaugumu par labu novadiem, kuros ir lielas vidusskolas. Atsevišķos reģionos var palielināties migrācijas centrtieces tendences. Tādējādi radikālo variantu šobrīd nav ieteicams realizēt.
2. Realizējot liberālo variantu (minimālais skolēnu skaits vidusskolas klasē ir 22, vidusskolā vismaz 66), varētu tikt reorganizētas apmēram 65-70 vidusskolas, vidusskolas nebūtu apmēram 28 novados. Tas būtu risināms jautājums.

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Implementation Results of Area Payments in Latvia

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Abstract
Subsequent to accession to the European Union (EU), direct payments were made available to Latvian farmers eventually constituting a material part of their income. Over the period of 2004 – 2007, LVL[1] 735 million of support payments have been disbursed to farmers, including LVL 430 million or 58% payments for the farmed areas. The dominating types of the latter are the single area payments, the complementary national direct support payments and funding within support measures of the Rural Development Plan (RDP). In Latvia, the support within agricultural sector is administrated by the Rural Support Service (RSS), therefore the present study analyses the resulting indicators of different area payments (total land and utilised agricultural land (AL), areas applied for support, number and structure of applications, amount and structure of the disbursed payments) in Latvia as the whole as well as across separate regions administrated by regional offices of the RRS in the time period of 2004 – 2007.
Key words: area payments, applications, financial support.

Introduction
As from signing of the EU Accession Agreement in 2003, Latvia has taken over the ACQUIS incorporating numerous changes in agricultural legislation.

Since 2004 the EU direct support schemes have been made available to Latvian farmers provided in the form of annual support payments per unit (hectare) of AL.

Already several years ago, I.Pilvere and A.Rukmanis pointed out that "situation was radically changed in 2004, when the support amount actually doubled relative to 2003 as farmers received access to the EU direct payments, RDP payments and the structural funds" (Pilvere, Rukmanis, 2006). L.Straujuma and K.Špoģis emphasised that "in regions dominated by commercially-oriented agriculture, the financial support of the EU is utilised for the production development; however in other regions it is mostly spent for daily consumption or solution of the social problems" (Straujuma, Špoģis, 2006). Similar studies on situations in the agricultural sector under the influence of the EU support are conducted in the neighbouring countries, e.g., in Lithuania where J.Čiburiene and Ž.Simanavičiene note that "the priorities of the government regulation policy of economic relations in agriculture were to sustain the employment level in the countryside and safeguard minimal level of farmers' living standards" (Čiburiene, Simanavičiene,2008). Fr.Muller emphasizes that "with the EU enlargement of 2004 the agro political framework undergoes a substantial shift. The integration of states with a strong agricultural sector and a large number of subsistence farmers could mean that the Common Agricultural Policy of the EU has to rearrange its political goals and instruments" (Muller, 2007).

In a similar way as the other new Member States (apart from Slovenia), Latvia is implementing the area payments within the scheme of Single Area Payments. Consequently, farmers have access to the Single Area Payment Scheme (SAPS), Complementary National Direct Payments (CNDP) and as from 2007: also support for crops of high energy value (MOA 2008).

The administration of the Area Payments is performed by the RSS: a state administrative institution supervised by the Ministry of Agriculture and operating pursuant to the Law on Rural Support Service (RSS Law, 2000). RSS consists of the Central Office located in Riga, the Aiviekste State Department of Land Reclamation and 9 Regional Agricultural Departments (RAD) implementing functions of the RSS in the particular areas. This study concentrates on analysing the information obtained in the RSS RAD areas (RSS, 2008) of Austrumlatgale RAD (districts of Ludza and Rēzekne), Dienvidkurzeme RAD (districts of Kuldīga, Liepāja and Saldus), Dienvidlatgale RAD (districts of Daugavpils, Krāslava and Preiļi), Lielrīga RAD (districts of Aizkraukle, Ogre and Riga), Viduslatvija RAD (districts of Jēkabpils

[1] Latvian lats

and Madona), Zemgale RAD (districts of Bauska, Dobele and Jelgava), Ziemeļaustrumi RAD (districts of Alūksne, Balvi and Gulbene), Ziemeļkurzeme RAD (districts of Talsi, Tukums and Ventspils), and Ziemeļvidzeme RAD (districts of Cēsis, Limbaži, Valka and Valmiera).

The study analyses different types of area payments (Cabinet…, 2008 a, 2008 b):

- SAPS;
- CNDP;
- support for crops of high energy value (CHEV);
- support payments within the RDP Measures:
  - ✓ least-favoured area support payments (LFA), broken down in 3 categories;
  - ✓ support for farming in areas with environmental restrictions (AER);
  - ✓ agro-environment (AE) incorporating several sub-measures: Development of Organic Farming (DOF), Maintenance of Biodiversity in Grasslands (BG), setting up of Buffer Zones (BZ), and Containing Erosion (CE);
- force majeure (FMA) support.

For the purpose of this study the following **hypothesis** has been set forth: since their introduction the Area Payments in Latvia tend to have a growing trend, both, in respect of the areas registered for support and the disbursed funding.

The hypothesis stipulated determined **the aim of the study**: evaluation and analysis of both, the number of applications for area payments and the areas in RAD regions covered by applications as well as, the amounts and types of the support disbursed.

For achievement of the above **aim** and verification of the hypothesis, the study seeks to solve the following specific **problems**:

1. Assessment of dynamics of the number of support beneficiaries by the regions of Latvia and its adequacy.
2. Study of areas applied for support, their structure and development across regions.
3. Analysis of the different aspects of support amount and structure under area payments.

The information used to solve the problems formulated under the present study is sourced from data accumulated by the Integrated Administration and Control System of RSS, State Land Service (SLS), regulatory enactments of the Republic of Latvia and data published by other researchers.

The methods applied to this study are the methods of grouping, structuring, dynamic time series analysis methods as well as the general analysis and synthesis, scientific induction and deduction methods.

Results and Discussion

1. Distribution of the support application numbers in Latvia

The data and computations included in Table 1 are used for solution of the first problem of the study.

Table 1

Number of applications for area support payments in Regional Agricultural Departments of RSS in Latvia (time period 2004 – 2007)

RAD/ years and indicators	Years				Basis increment of 2007 versus 2004, %	Structure of application numbers in 2007, %
	2004	2005	2006	2007		
Austrumlatgale	9267	11473	11864	11291	122	14
Dienvidkurzeme	7486	8091	8197	8058	108	10
Dienvidlatgale	15501	17726	17809	16848	109	22
Lielrīga	4509	4976	5202	5055	112	7
Viduslatvija	6245	7692	8152	7909	127	10
Zemgale	6208	6135	5882	5890	95	8
Ziemeļaustrumi	6984	8122	8521	8079	116	10
Ziemeļkurzeme	5026	5225	5347	5226	104	7
Ziemeļvidzeme	8359	9170	9455	9284	111	12
Total:	**69585**	**78610**	**80429**	**77640**	**112**	**100**
Chain increment %	-	113	102	97	x	x

Source: authors' calculations according to the RSS data of 2005-2008

There are several observations and conclusions to be made from the data of Table 1:

- The number of area support payment applications conforms to the number of area support beneficiaries.
- the number of area support payment applications has increased in 8 regions out of 9; while in Zemgale RAD, the number of applications in 2007 has decreased by 5% in comparison with 2004.
- The highest increase of applications is observed in Viduslatvija RAD (27%) and Austrumlatgale RAD (22%).
- The highest number of applications for area payments have been received in 2006, namely 80429 applications; in 2007 it dropped by 3% but nevertheless was by 12% higher than in 2004.
- In 2007, a little more than 1/5 of all the applications for area payments were received in Dienvidlatgale RAD, the lowest proportion of applications from the total number came to Ziemeļkurzeme and Lielrīga RAD.

2. Territory of Latvia and areas of RAD regions

Scrutinizing the areas in respect of which the support applications have been submitted, it is crucial to understand the size of Latvia and the proportion of its territory covered by agricultural land (AL), as well as the division into RSS RAD departments.

On the basis of information included in Table 2, the following conclusions can be made:

- According to the State Land Service data as on January 1, 2008, the total territory of the Republic of Latvia is 6 450424.3 ha, including 37.9 % of agricultural land and 45.6% of forest.
- As to the total area, the largest region is Ziemeļvidzeme; it incorporates 1036.95 thousand ha or 16.1% of the whole territory of the Republic if Latvia, likewise the agricultural land in this region takes up a proportionally larger part than in other regions. This is explained by the structure of this region embracing 4 administrative districts: Cēsis, Limbaži, Valmiera and Valka. Thus, it is the largest of the RSS regions.
- The second largest AL areas are found in Dienvidkurzeme RAD: 325.04 thousand ha and in Dienvidlatgale RAD with 323.60 thousand ha.
- Areawise, Zemgale region is the smallest, with 517.73 thousand ha which is twice less than in the above largest region: Ziemeļvidzeme.
- Regarding the proportion of AL within the total land area, it should be noted that it is the highest exactly in Zemgale region where it occupies 56.6% of the total land area: a regularity explaining Zemgale being called the "grannary" of Latvia as it possesses the most fertile land.
- The territory of Ziemeļkurzeme RAD possesses relatively less agricultural land for the territories of districts laying within it border on the coast-land areas near the sea where, as is generally known, the soils are sandier, the territories are richer in forests and lands insufficiently fertile to support agricultural production. Ziemeļkurzeme region governs 421.89 thousand ha of forests. Nevertheless, it is important to establish the indicator of the agricultural land proportion

Table 2

Breakdown of land in areas of RAD as on January 1, 2008

RAD/Indicators	Total land area		AL		AL of total area of RAD, %	Forests	
	ha	%	ha	%		ha	%
Austrumlatgale	523852.5	8.1	240347.8	9.8	45.9	178942.8	6.1
Dienvidkurzeme	833396.8	12.9	325039.6	13.3	39.0	385164.7	13.1
Dienvidlatgale	691330.6	10.7	323595.7	13.2	46.8	236617.8	8.1
Lielrīga	793500.1	12.3	224882.1	9.2	28.3	402473.1	13.7
Viduslatvija	633554.9	9.8	232859.0	9.5	36.8	288642.4	9.8
Zemgale	517730.4	8.0	293161.3	12.0	56.6	156075.5	5.3
Ziemeļaustrumi	649103.0	10.1	223213.6	9.1	34.4	334002.5	11.4
Ziemeļkurzeme	771005.2	12.0	234091.7	9.6	30.4	421886.2	14.4
Ziemeļvidzeme	1 036950.8	16.1	345919.9	14.2	33.4	534375.9	18.2
Totally per country:	**6450424.3**	**100.0**	**2443110.7**	**100.0**	**37.9**	**2938180.9**	**100.0**

Source: authors' calculations according to the SLS data of 2008

there. Looking at each district within this region separately and scrutinising the distribution of AL across districts, one can get a totally different picture: 45% of AL lie in Tukums district, 34% in Talsi district and 22% in Ventspils district.

3. Areas declared for area support payments

To be able to qualify for area payments, the farmers need to observe the basic requirements governing support for SAPS. The most important of them (Cabinet…, 2008a) are the following:

- AL should be free of shrubs and plants of the invasive genus of Giant Hogweed;
- it has not paludified and the self-afforestation process has not set in;
- it conforms to the conditions of good agricultural and environmental status;
- as on June 15 of the current year the land in question is owned or possessed (in use) by the farmer.

Apart from SAPS support requirements, it is important to preserve the land in good agricultural and environmental condition (Cabinet…, 2008a):

- Over the vegetation period (usually from May to September) the agricultural land is cultivated and used for growing crops in compliance with agro-technical methods appropriate for the particular species and cropland management techniques (observing the correct planting times, fertilisation rate, weed control restrictions, and other plant protection measures).
- The land-reclamation systems on the agricultural land in question should be properly maintained.
- The plants, vegetal waste and stubble should be tilled in the soil for promotion of fertility of the agricultural land.
- Permanent meadows and pastures as well as permanent grasslands on arable land should be grazed and mowed or at cut at least once per year, removing the cut material from the field or chopping it up and spreading on the land by August 1 of the current year.

The areas declared by farmers for Area Payments and their structure are summarised in Table 3.

There are several conclusions to be made on areas declared for SAPS, their structure and modification processes or trends stemming from Table 3:

- As from 2004, the first year of applying for area payments, the declared areas have enlarged by 19% per year reaching 1561.12 thousand ha in 2007. The fastest growth rate is observed in 2005, in subsequent years the volume of areas gradually stabilises.
- The highest growth rate of area increment is observed in Austrumlatgale and Viduslatvija RADs 37% on average over the reference period.
- The largest areas declared for SAPS over the period of 2004 – 2007 were situated in the territory of Zemgale RAD, which had to be expected after analysing the information included in Table 2. Just Zemgale region demonstrates the lowest

Table 3

Areas declared for SAPS in RAD regions over the period of 2004 – 2007

RAD/years and indicators	2004		2005		2006		2007	
	Thousand ha	%	Thousand ha	%	Thousand ha	%	Thousand ha	%
Austrumlatgale	97.16	7.4	123.90	8.3	133.85	8.6	133.02	8.5
Dienvidkurzeme	190.57	14.,5	213.77	14.4	221.18	14.3	225.12	14.4
Dienvidlatgale	173.62	13.2	198.58	13.4	204.14	13.2	204.32	13.1
Lielrīga	99.60	7.6	111.21	7.5	115.21	7.4	115.53	7.4
Viduslatvija	111.77	8.5	142.56	9.6	152.25	9.8	153.90	9.9
Zemgale	216.15	16.5	223.97	15.1	226.37	14.6	228.06	14.6
Ziemeļaustrumi	102.19	7.8	122.97	8.3	131.99	8.5	132.34	8.5
Ziemeļkurzeme	137.19	10.5	146.68	9.9	152.58	9.9	155.10	9.9
Ziemeļvidzeme	184.31	14.0	201.53	13.6	209.88	13.6	213.73	13.7
Totally per country	**1312.56**	**100.0**	**1485.17**	**100.0**	**1547.46**	**100.0**	**1561.12**	**100.0**
Chain increment rate, %	-	x	113.3	x	104.2	x	100.9	x

Source: authors' calculations according to the RSS data of 2005 – 2008

area increment for this period reaching only 5.5% margin. This can be explained by the fact that already during the first year of application, farmers had adequate information and they were active in declaring their areas for support.

- The SAPS reference area for Latvia has been fixed at 1 475 000 ha (EU Representative …, 2008). Thus, since 2005, the farmers have exceeded the fixed reference area by different levels: 0.7% in 2005, 5% in 2006 and 6% in 2007 meaning that the amount of support payable for each ha has been reduced.
- Comparing the structure of applications for 2007 (Table 1) and the areas declared for support, it is evident that within this structure, areas conforming to the number of applications are found only in 2 regions: Lielrīga and Viduslatvija RADs, while in 3 regions (Dienvidlatgale, Austrumlatgale and Zieme̦laustrumu RADs), there is a relatively small proportion of areas per a large number of applications; however the four remaining regions demonstrate a direct opposite tendency: a relatively small proportion of applications covering a higher volume of declared areas.

The information included in Figure 1 demonstrates certain modifications and trends in declaration of AL areas for receiving support payments:

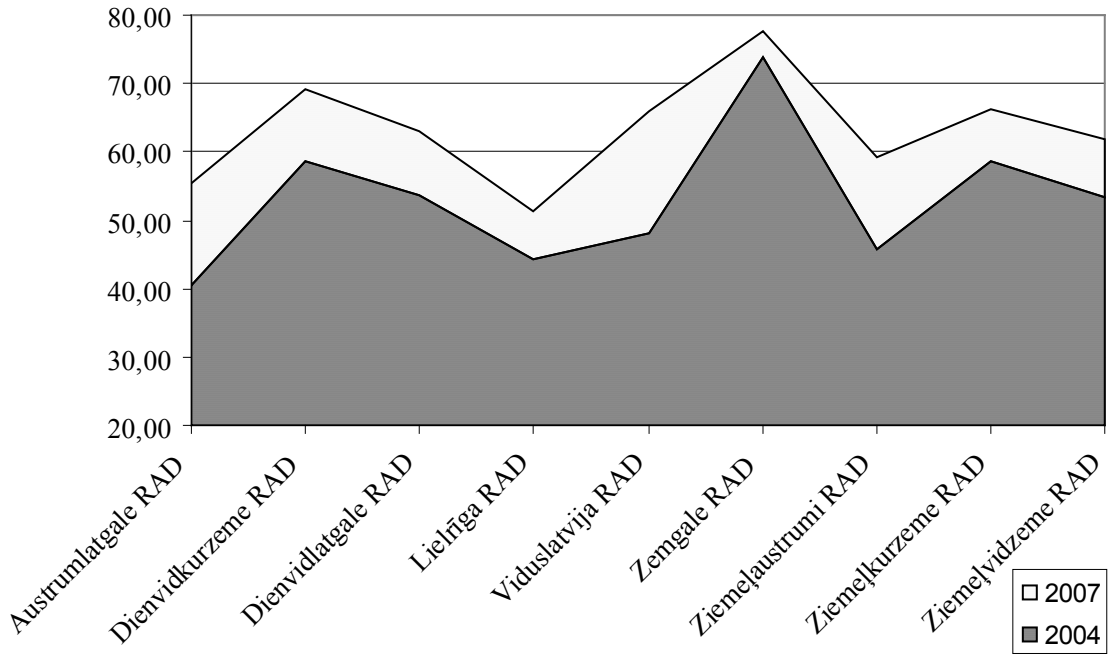
- The area of AL declared for area payments has increased in all RSS regions, e.g., if in 2004, 40.42% of AL in Austrumlatgale region was covered with applications, then in 2007, already 55.34% of all AL was covered with SAPS applications demonstrating 14.92% increase.
- In 2007, the farmers of Zemgale region had applied for SAPS in respect of 77.79% of all AL of the region while the lowest proportion of area covered with applications was in Lielrīga RAD: only 51.37% of total AL which can be explained of utilising AL for other purposes than agricultural production.

4. Funding of Area Payments

Table 4 contains accounts of the funding disbursed to farmers under area payment schemes in the time period of 2004 to 2007.

Analysing the above information (Table 4), several conclusions can be drawn:

- The support amount disbursed under area payment schemes have increased from LVL 72.50 million in 2004 to LVL 117.81 million in 2007 or by 62.5 % and over the whole reference period totals LVL 430.3 million.
- The largest share of the support amount disbursed is formed by payments for the Least Favoured Areas: 30.1% of the total funding under area payments, while Agro-environment payments have relatively low proportion. Regarding the



Source: made by the authors according to the RSS and SLS data, 2005 – 2008

Figure 1. **Correlation of area declared for SAPS to the whole AL of the region over the period of 2004 - 2007, %**

Table 4

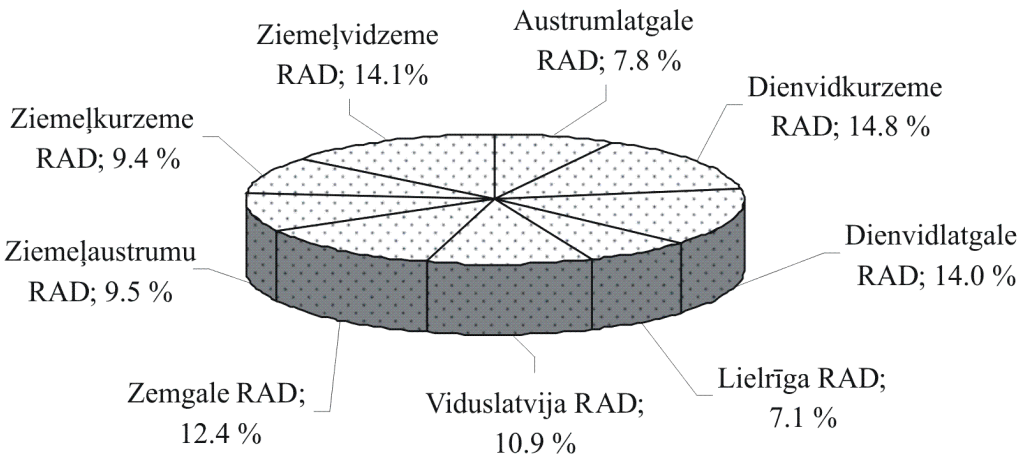
Types of area payments, dynamics and structural development thereof in Latvia over the period of 2004 – 2007

Type of support	Unit of measurement	Years				Total	Base increment rate, %
		2004	2005	2006	2007		
SAPS	thousand LVL	17441.0	26708.0	33651.5	39033.9	116834.4	123.8
	%	24.1	27.0	23.9	33.1	27.2	X
CNDP	thousand LVL	23300.2	25060.6	24943.1	25397.2	98701.0	9.0
	%	32.1	25.3	17.7	21.6	22.9	X
CHEV	thousand LVL	X	X	X	793.5	793.5	X
	%	X	X	X	0.7	0.18	X
LFA	thousand LVL	27492.9	35043.8	37187.9	29896.8	129621.4	8.7
	%	37.9	35.4	26.4	25.4	30.1	X
AER	thousand LVL	X	1390.9	1592.8	1277.9	4261.6	X
	%	X	1.4	1.1	1.1	1.0	X
AE	thousand LVL	3406.6	8558.2	12095.7	9389.0	33449.5	175.6
	%	4.7	8.7	8.6	8.0	7.8	X
BG	thousand LVL	858.4	1801.1	2614.5	2423.5	7697.5	182.3
	%	1.2	1.8	1.9	2.1	1.8	X
BZ	thousand LVL	X	32.1	41.1	33.0	106.2	X
	%	X	0.03	0.03	0.03	0.02	X
CE	thousand LVL	X	X	10094.5	9562.4	19656.9	X
	%	X	X	7.2	8.1	4.6	X
FMA	thousand LVL	X	323.9	18856.4	X	19180.3	X
	%	X	0.3	13.4	X	4.5	X
Total area payments	thousand LVL	72499.1	98918.6	141077.5	117807.0	430302.2	62.5
	%	100.0	100.0	100.0	100.0	100.0	X
Total support	million LVL	110.5	219.7	213.3	191.5	735.0	73.3
Proportion of area payments	%	65.6	45.0	66.1	61.5	58.5	X

Source: authors' calculations according to the RSS data, 2005 – 2008

base increment rates, there have been 8.7% of payments for Least Favoured Areas which is not a high rate. This can be explained by modifications adopted in payment conditions.

- 50.2% of all area payments over the reference period are direct payments: SAPS and CNDP. Starting from 2007 CNDP are differentiated in two types: as coupled and decoupled payments (MOA, 2008).
- The occurring increase of disbursed amounts for SAPS payments is observed not only due to larger numbers of applications and larger areas declared but also due to increment in the support rate by 83%: from EUR 20.66 in 2004 to EUR 37.84 per ha in 2007.
- The most massive base increment rates of the disbursed amounts are observed for sub-measures Agro-environment, Development of Organic Farming and Maintenance of Biological Diversity in Grasslands, 175.6% and 182.3% accordingly. Despite that, over the period from 2006 to 2007, the actually disbursed support amount under the said sub-measures is reduced, for as the result of legislation amendments in 2007, new commitments were not undertaken and there were a number of support beneficiaries



Source: made by the authors according to the RSS data, 2005 – 2008

Figure 2. **Break-down structure of funding for area payments in RADs of RSS in 2007, %**

defaulting the commitments undertaken previously, in 2004 – 2006, leading to recovery of a part of the disbursed amount by the State Treasury.

- A new support measure has been made available as from 2007: support to raising high energy value crops. Over 2007, 793.5 thousand LVL have been paid out under this measure.
- The total support to farmers in 2004 – 2007 constitutes LVL 735 million, including 58% of area payments. Consequently area payments play an important role in the maintenance and promotion of the development level in rural regions.
- The highest proportion of area payments was reached in 2006: 66.1% of the total disbursed support or LVL 141.1 million which can be explained by the availability of funding from the Government Budget and FMA support disbursement for damages to agriculture caused by draught and unfavourable weather conditions over the summer of 2006 as decision was adopted to partly compensate the losses incurred for the draught-affected areas under cultivated food and feed crops. Thus in 2006, LVL 18.5 million was paid as FMA while in 2005, the same type of support was provided to farmers for losses incurred due to excess rainfall.

The structural analysis of area payments in regional trench is reflected in Figure 2.

The information summarised in the above figure clearly demonstrates that the largest share of funding goes to farmers of 3 RADs: Dienvidkurzeme, Ziemeļvidzeme and Dienvidlatgale, while the smallest amount is received by those of Lielrīga and Austrumlatgale. Looking at the structure of applications (Table 1) and the structure of the declared areas in regions (Table 3), and comparing both with the structure of the funding received; one can conclude that the structure of funding conforms to the structure of the declared areas.

Conclusions

1. One of the most important elements of the CAP common market organisation is direct area payments: a yearly financial support to farmers fully funded from the EU budget. In Latvia, farmers can receive support within the Single Area Payments' Scheme including SAPS, CNDP and as from 2007, also High Energy Value Crops as well as decoupled payments. There are several area-type support measures incorporated also in the Rural Development Plan.
2. Over the period of 2004 – 2007, the number of applications for area payments displays a stable upward trend, consequently so does the number of beneficiaries, areas declared and the funding received.
3. In 2007, the highest number of support applications is received by Dienvidlatgale RAD: 16 848 or 22% of the total number, the smallest: in Lielrīga and Ziemeļkurzeme RAD, 7% of the total amount accordingly.
4. In 2007, the areas declared for area payments reached 1561.12 thousand ha achieving 19% increase in comparison with 2004 - the first year of application for area payments. The reference area of SAPS was exceeded already in 2005, and in 2007 the areas in excess reach 6% causing a proportionally reduced rate of support per farmed ha of AL.
5. The largest AL areas are found in Zemgale region, where self-evidently also the largest areas

have been declared for SAPS over the reference period: 228 thousand ha constituting 14.6% of the total area declared for support.

6. Over the period of 2004 – 2007, the funding disbursed in area payments made up LVL 430.3 million having grown from LVL 72.50 million in 2004 to LVL 117.8 million in 2007.
7. Within the financing structure of the period 2004 – 2007, the highest proportion of support was paid out under RDP Measure "Support to Less Favoured Areas" (30.1% of the total amount of area payments); while the direct payments SAPS and CNDP constitute a half of the area payment amount disbursed and relatively low proportion of payments are made under the measure "Agro-environment".
8. The structure of Area Payments in regions conforms to the structure of the declared areas, while it fails to conform to the structure of the received support applications and consequently to the structure of beneficiaries.

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Kopsavilkums

Pēc iestāšanās Eiropas Savienībā (ES) Latvijas lauksaimniekiem ir pieejami tiešie maksājumi, kas veido būtisku daļu no ienākumiem. Laika periodā no 2004.-2007.gadam lauksaimnieki atbalsta maksājumos ir saņēmuši 735 miljonus latu, no kuriem 430 miljonus jeb 58.5 % veido dažādi maksājumi par apsaimniekotajām zemes platībām. Galvenie no tiem ir - vienotais platības maksājums, papildu valsts tiešie maksājumi, Lauku attīstības plāna atbalsta pasākumi. Lauksaimniecības nozares atbalsta maksājumus Latvijā administrē Lauku atbalsta dienests (LAD), tāpēc šajā pētījumā ir analizēti dažādi platību maksājumu rezultatīvie rādītāji Latvijā un LAD reģionos 2004.-2007.gadu periodā - kopējā zemes un lauksaimniecībā izmantojamās zemes (LIZ) platība, atbalstam pieteiktās platības, iesniegumu skaits un struktūra, izmaksātā finansējuma apjoms un struktūra.

Impact of Investments on the Number of Visitors in the Heritage Maija Park of Cēsis, Latvia

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Abstract
Visits of Heritage Parks are being affected by many factors. The aim of this research is to define the growth for the number of visitors related to the event dependence on expenditures used for maintenance historical parks. The research is set in Cēsis town historical park "Maija Park" in Vidzeme region, Latvia. The author analyses researches about similar problems in parks that are linked with the number of visitors in terms of factorial sign *financial means of maintenance and renewal*, made by the world known researchers. The author analyses the situation and problems of historical parks in Latvia, Cēsis town and in the researchable object – "Maija Park". The research results showed a strict linear correlation (r = 0.936) that points to the necessity to invest more finances into improving environment of historical parks in order to increase attendance of certain cultural events.
Key words: Heritage parks, visitor, expenditures of funds.

Introduction
The vision of the United Nations World Tourism Organisation on doubling amount of tourists by the year 2020 is not possible due to economic crisis, which certainly will also affect cultural tourism. During the present economic situation of Latvia, the regional tourism has to respond without a delay. The optimisation of funds also affects cultural tourism, therefore it is essential to calculate, and analyse how to manage in such a manner to achieve goals, and gain visitors. Well managed Heritage parks (hereinafter: HP) as a cultural heritage environment are an integral part of person's quality of life that require investing not only physical work but also financial resources. The management of HP has to comply with the Principles of the Cultural Tourism Charter and repose to history knowledge and management of parks (International ICOMOS, 1999). Problems of parks and their visitors have been investigated by many foreign researchers (Aoki Y., 1999; Coccosis H., 2000; Graefe A.R. and Thapa B., 2004; Jacob G.R. and Screyer R., 1980; Manning, 1999a, 1999b, 2007; Trakolis D., 2003), but there has not been a direct focus on HP. Parks of castles and manor houses in Latvia have been researched by Gundega Lināre, Māra Janelis, Ināra Bondare, Juris Zviedrāns. Imants Lancmanis, and Dainis Bruģis who have analysed parks in their researches of history of palaces and manor houses. In general, HP in Latvia have been researched in few numbers, mostly in historical aspect, renovation, but not within nowadays management of Heritage parks. Renewed and spruced parks in Latvia such as Rundāle, Bīriņi palace parks show great number of visitor inflow. The number of visitors of HP can be affected by the following factors: climate, organisation, policy, etc. The author's choice of factors was defined by the necessity of capital for reconstruction; possibility to attract the European Union (EU) structural fund finances in order to grow attendance of visitors. After the first stage of reconstruction of historical park "Maija Park" of Cēsis town in Vidzeme region, a considerably larger number of visitors have been estimated. In the period of one year the number of visitors has increased by 12.6%. Regarding the fact that tourism is a priority of the town of Cēsis, it was necessary to verify if the financial investment in maintenance and renovation of HP had such an important role as it had to be ascertained on the efficiency of attracted finances from the EU structural funds.

The hypothesis of the research: The number of visitors' growth of Heritage parks is connected with the amount of expenditures used for maintenance and renovation of a particular HP.

According to the hypothesis, **the aim of the research** was to define whether the growth of visitors' number of Heritage Park "Maija Park" in Cēsis town is connected with expenditures used for maintenance and renovation of the particular HP.

In order to achieve the aim **the tasks** dealt with were to:

1) ascertain tendencies of research of historical parks within the context of visitor attachment influencing factor: finance expenditures used for maintenance and renewal of park.

1) determine a connection between the number of visitors of an event held in "Maija Park", and expenditures used for maintenance and renewal of park.

Methods used in the research: monographic descriptive method, analysis and synthesis methods, scientific induction and deduction methods, graphical method, and interviews with experts. Correlation analysis and regression analysis were used for determining the connection between quantitative signs and for drawing conclusions, also in order to define what regularity causes change of fruitful sign if the values of factorial sign changes.

Scientific publications, passed regulations and laws, tourism documents, statistical data by local governments and various organisations of the World, Europe and Latvia as well as the municipality of Cēsis provided materials by interviewing experts and information from the Internet were used for reaching aims, solving tasks and verifying the hypothesis.

Materials and methods

1. Study area and materials

Investment of finance expenditures for maintenance and renewal of parks was analysed as one of the influence factors to evaluate possibilities for increasing attendance of the events in HP.

Only the attendance data from events organised in HP of Cēsis town, "Maija Park" during the period from 2005 to 2007, and expenditures for maintenance and renewal of park during the same period of time were used for examining.

"Maija Park" is a part of National architecture monument: "An ensemble of Old and New building Palace". It consists of two functional zones: *passive* recreational uses in Lenču Street 4b, and children and youth active recreation zone in Lenču Street 4c. The park is a property of Cēsis local government, and according to the data of Cēsis local government municipal service has an area of 11064 m^2. According to Jānis Sirlaks an expert of municipal finances since 2002 Cēsis Town Council by attracting the EU finances has invested LVL 150,000 in the park reconstruction. The park has been declared as one of the 100 most spruced culture monuments in Latvia. On September 10, 2005 the flag of European Heritage was raised in the park. In July, 2006 Cēsis town commemorated its 8th centennial anniversary, with a jubilee concept "Through Festivals Ordered and Recognisable Town. "Maija Park" was Cēsis town 8th centennial improvement project of the town environment. The original idea was to structure „Maija Park" as a silent recreation park with high quality landscape and dendrology values. As a result of reconstruction, an idea of increasing the number of attendance occurred, by using the park for cultural events, to achieve greater return from reconstruction.

Attendance of events is being recorded by two culture institutions of Cēsis local government, which guide culture processes in Heritage park "Maija Park" (hereinafter: HMP): Cēsis Cultural Centre and an agency of local government – Vidzeme Heritage and Tourism Centre (hereinafter: VHTC).

Cēsis Cultural Centre (hereinafter: CC) is a multifunctional culture institution in the centre of the town, where high quality art performances, concerts, and dramatic activities are held. A part of these activities and social gatherings are held in "Maija Park". The most attended from these activities are: Florists' contest, Children Days, Theatre Days, and Dance contest "Solstice in the Solstice", "Welcoming Midsummer Eve". A part of these activities is free of charge, like Boys' choir concert, Theatre song contest, Theatre for children, performances, games, and creative workshops. While attending the town of Cēsis tourists willingly turn into the Heritage "Maija Park" territory – they attend organised events, they enjoy beautiful and scenic town environment. In 2005 HMP was attended by 1.6% of total tourists attending Cēsis town, but in 2006 – 1.4%, moreover, in 2007 – 1.1% (Table 1). It means that HMP has to popularise the park and increase expenditures used for landscaping park. Within this the author draws attention to the fact that the usage of "Maija Park" has insufficient role in VHTC strategy for the period of 2007 – 2010 (VVTC, 2007).

The aim of Vidzeme History and Tourism Centre (VHTC) is to take care of preserving heritage values, and to use these values for educating society in order to stimulate tourism development in Cēsis town and district. The agency manages two parks: one of them – examined in the research – „Maija Park". VHTC rents parks, after conclusion of a contract, for events, and Cultural Centre (CC). Non-commercial activities can be held in the park without a charge. The tenant overtakes the park with management deed from leaseholder VHTC and holds material responsibility of preserving environment of the park and, if necessary, refunds inflicted damage to the park.

Attendance of events is being recorded with the following methods: by amount of sold tickets and visually. Precise data are acknowledged by the amount of sold tickets. It is more difficult to determine the number of visitors of a non-commercial event, and then a more abstract, visual method is used. The data handed over by VHTC, Cēsis local government Municipal community management department and Cultural Centre (CC) Cēsis town, differ; therefore the author has used the mean in calculations.

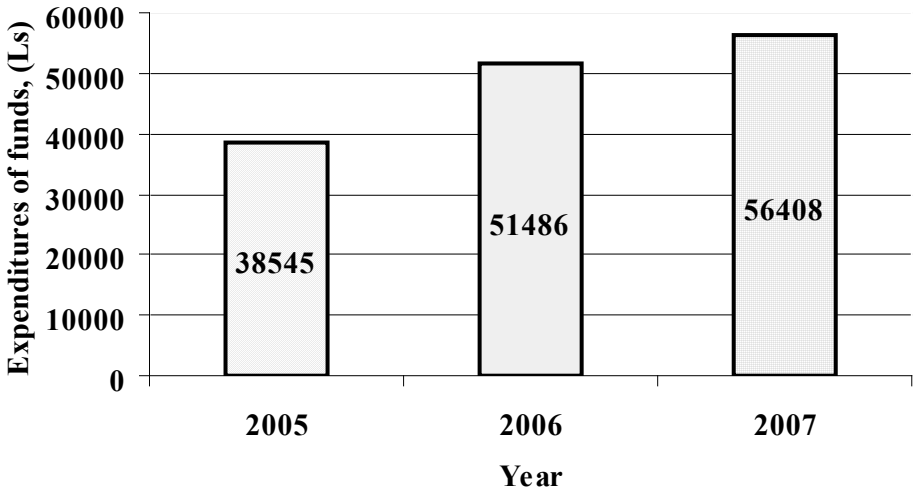
Monitoring and calculation of **Expenditures used** in the Heritage "Maija Park" for **maintenance and renewal** is being done by Cēsis local government Municipal community management department (hereinafter: MCMD) according to the regulations of the Cabinet of Ministers of Latvia (LV, 2006). Collaboration partners: SIA "Kliģēni" (territory management), SIA "Jumis" (scavenging), SIA "Spriegums" (wirework repair), Alvits Grīvnieks (maintenance of waterworks) and A/S Falck (security services of objects). There is a surveillance system set up in "Maija Park" to ensure order, and safety of the park and visitors. In 2004 according to the data provided by an expert of MCMD a contract was signed ensuring maintenance of HMP amounting to LVL 18,370 a year. In 2008 another contract envisaging 30% increase of the annual amount was signed. Additionally the EU finances are being used for gradual HMP reconstruction and repairing the damage done to the park, such as: damage or destruction of landscape designing, architectural elements or infrastructure by irresponsible persons. The research information does not include donations for improving environment of HMP, for example, purchase of rubbish bins, establishment of children playground, and renovation of the shanty for the black swans, done by legal and natural entities. In the period from 2005 to 2007 on average LVL 48,813 were spent for maintenance, reconstruction and repairing damage. The rapid growth of expenditures: in 2006 by 33.6% and in 2007 by 46.3% in comparison with 2005 can be explained with the implementation of Stages I and II of the reconstruction project of "Maija Park" dedicated to the 8th centennial anniversary of Cēsis town (Figure 1).

Table 1

Visitors of Cēsis town and visitors of events in Heritage "Maija Park"

Year	Visitors of Cēsis town	Visitors of events in the Heritage "Maija Park"
2005	235.000	3.686
2006	341.500	4.853
2007	426.500	4.873
TOTAL	1003.000	13.412

Source: authors' calculations according to the data of VHTC, Cēsis MCMD, and Cēsis CC



Source: authors' calculations according to MCMD

Figure 1. **Dynamics of expenditures of financial funds and maintenance and renewal** of **Cēsis town heritage "Maija Park" in 2005-2007** (LVL)

2. Methods

First of all, the author has analysed studies by the world heritage park researchers, materials of international and local institutions, and social organisations related to the heritage parks.

Secondly, materials from different sources about Heritage parks of Latvia were used, among them materials on "Maija Park", Cēsis town, Vidzeme region and current problems of the parks in Latvia which are connected with the theme of the research. A senior specialist of the Monument Documentation Centre from the State Supervision Institution of Protection of Historic Monuments, Gunta Bu a was interviewed to define the data more precise.

Thirdly, the author has used statistical data as the basic information, gained from polled specialists of institutions of Cēsis Council, who have a connection with the maintenance and usage of "Maija Park": Jolanta Sausiņa, a director of the agency of Vidzeme History and Tourism Centre (VHTC) of Cēsis local government; Juris Markovs, a deputy director in economic activities; Evita Kinča, a specialist of Cēsis Tourism and Information Centre (TIC); Ija Groza, a director of Culture Centre (CC); and Jānis Sirlaks, a landscape architect of Cēsis town municipal department landscape architect.

A correlation analysis, null hypothesis testing – one factor linear regression were used for calculating relation of the number of visitors of "Maija Park" and financial expenditures used for maintenance and renewal of the park. A correlation diagram was used to visually determine a relation type between a factorial *Expenditure of financial funds* and a resulting sign *Number of visitors*. A one factor linear regression was determined, also determination coefficient *R Square* which indicates how large scatter part of regression *Number of visitors* was clarified by its linear connection with a regressor *Expenditure of financial funds* and Standard deflection as well as *Error of the Estimate* which describes scattered density of observation were used to study relation between preconditions and forecasting.

Research results and discussion

The United Nations World Tourism Organisation estimates that the number of arrivals in Europe will be 720 million tourists per year by 2020. The tourism growing will have an increasing impact on cultural heritage. In its forecast Tourism: 2020 Vision, the United Nations World Tourism Organisation (UNWTO), predicts that cultural tourism will be one of the important key tourism market segments in the future (World Tourism Organisation, 2001). As more important, since culture tourism is one of the tourism fields with "Highest increase coefficient", this form of tourism is connected with interesting opportunities in the field of art, particular landscapes of nature, cities with plenty of art traditions, regions where heritage values and local traditions are especially concentrated (EUR-Lex*, 2006)*.

In Latvia culture tourism is acknowledged as one of the State Strategically tourism resources. Cultural Tourism is a priority in the development programme of Cēsis town for the period of 2007 – 2014, and in the strategy of VHTC for the period of 2007 – 2010. Since 2005 the number of attendance of tourism objects in Cēsis town has doubled and has reached 1 million visitors, wherewith also the attendance of "Maija Park" has increased (Table 1) (Development programme of Cēsis Town, 2007; VHTC, 2007).

Unfortunately, due to the economic crisis, the vision is not possibly to be fulfilled in terms of time. Nevertheless, exactly now, when the World Economy experiences hard times and the growth of tourism market of Latvia has decreased, a flexible reaction to the changes in sales and economic situation is needed. Especially it refers to the countryside tourism of Latvia. Cultural heritage stimulates sustainable development and has a great role in the increase of competitiveness and development of the countryside territories. Maintenance and renewal of cultural history parks determines the quality of culture-environment and sustainability that stimulates attendance.

In its turns, to attract visitors, the Heritage Park has to be at interest of visitors favouring condition. According to the Principles of the Cultural Tourism Charter (ICOMOS International Cultural Tourism Charter), they "should present high quality information to optimise the visitor's understanding of the significant heritage characteristics and of the need for their protection, enabling the visitor to enjoy the place in an appropriate manner". At the same time "between heritage resources or values, tourism is dynamic and ever changing, generating opportunities and challenges as well as potential conflicts" (International ICOMOS, 1999).

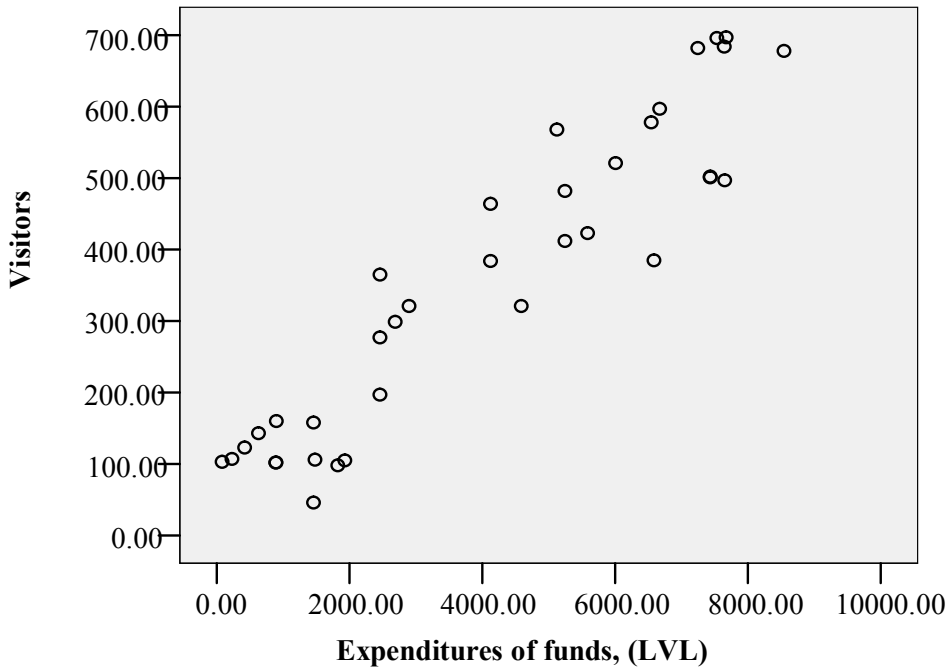
The prevention of reasons, originating potential conflicts (Jacob G.R. and Screyer R., 1980, Graefe A.R. and Thapa B., 2004), adjusting carrying capacity of parks (Manning, 1999a, Coccosis H., 2000, Trakolis D., 2003), establishing optimum number of visitors in public parks (Aoki 1999, Manning, 1999b, 2007) has been in the eyesight of researchers. The author did not manage to find researches that would analyse a direct connection between fluctuations of number of visitors of Heritage Parks and expenditures. However, a finding during a research by Jacob and Graefe and their colleagues has to be considered (Jacob G.R. and Screyer R., 1980, Graefe A.R. and Thapa B., 2004). This finding shows that the main potential of conflict lies in the infrastructure

and visitor value conflict, which implicitly indicates to linking between importance of resources invested in maintenance and desire to attend a tourism object. On the contrary, excessive attendance, as pointed by Manning, Coccosis, Trakolis (Manning, 1999a, Coccosis H., 2000, Trakolis D., 2003), shall be limited in order not to cause degradation of park environment, while the capacity can be increased by improving quality of environment which the author agrees with. Yoji Aoki came to a conclusion that in Japan parks, examined within his research, a visitor is feeling discomfort if there are 700 visitors in park with the area of 7 ha (Aoki, Y., 2002). However, it has to be borne in mind that the specific of parks in Japan and the fact that Maija park in Cēsis town is a park with good infrastructure and remaining in its area of 1.1 ha for short period of time, in the author's opinion, should not cause discomfort, yet this issue is a potential subject of a research. Studies of heritage parks, which in the author's opinion hold greater, load than, for example, Nature parks, also due to their smaller sizes, are being insufficiently displayed in scientific literature.

Although Heritage parks in Latvia can not be compared with the largest parks of the world due to their size, they are an important part of cultural heritage of Latvia. They have been created by greatest landscape architects of Latvia and Europe like: Kufalts, Andrejs Zeidaks, Kārlis Barons and others. There are three organisations connected with Heritage parks: Association of Latvian Castles, Palaces and Manors (ALCPM), Dendrofloral Laboratory of Salaspils Botanical Gardens, and opened social fund Depository of Nature Rarity that take part in exploring parks as well as solving restoration and maintenance issues. Not all of the Heritage parks in Latvia have been recorded and studied. In collaboration with the Monument Documentation Centre of the Ministry of Culture, and according to an expert Gunta Bu a, an audit has been done only in 384 of about 1000 parks. Parks are differently maintained, and they are in different conditions. These parks have various style and form, but nowadays none of them remains their original look. Mostly the trees are outgrown or shrivelled up, territories have become overgrown with low-grade species of trees, ponds are grassed, and the infrastructure is in a bad state.

At the same time there are many well spruced heritage parks, such as, park of Rundāle Palace, or park of Bīriņi Palace, which well tended environment, is attended by great numbers of tourists.

There are 5 parks in Cēsis town, but only 2 of them are acknowledged as tourism objects: "Pils Park" and "Maija Park". Tourism is declared as a priority in the development programme of Cēsis town for the period of 2007 – 2014, and preserving of heritage landscape is brought forward as a precondition for tourism development. Improvements of landscape



Source: Authors' calculations according to the data from VHTC and Cēsis CC

Figure 2. **Correlation diagram representing attendance of event held in historical Maija Park and financial expenditures for the period of 2005 – 2007**

Model	Unstandarised Coefficients		Standardised Coefficients	t	Sig.	95% Confidence Interval for B	
	B	Std.Error	Beta			Lower Limit	Upper Limit
Constant Expenditures of fund, (LVL)	61.042 0.073	22.943 0.005	0.00 0.936	2.661 15.52	0.012 0.000	14.418 0.064	107.667 0.083

Source: authors' calculations according to the data from VHTC and Cēsis CC

Figure 3. **Summary evaluation of linear regression of Heritage park "Maija Park" of Cēsis town** (Coefficients - Dependent Variable: Visitors)

designing, environment and infrastructure require financial investigations. The author proved this necessity by doing calculations with a correlation method.

The choice of correlation method was determined (Figure 2) by correlation or scatter diagram, which visually allowed to establish a positive linear connection type between signs *Number of Visitor* and *Expenditures of funds* used for maintenance and renewal of HMP. The diagram allowed defining scatter density of the acquired dots around the supposed connection curve.

While performing the correlation analysis, results enabled to come to a conclusion that between both signs *Expenditures of financial funds* and *Number of Visitors* a statistically important, stable correlation exists (r = 0.936) at the possibility rate of 99%. Due to the actual evaluation of the test, t = 15.52 with the level of relevance $\alpha = 0.01$ or probability P = 1 - α = 0.99 *Null Hypothesis* can be rejected, and it can be assumed that a relevant positive, linear relation exists between *Number of Visitors* of Heritage "Maija Park" and *Expenditures of financial funds* spent for management of the park (Figure 3).

The calculation of regression shows the following results of regression equation: the value of correlation coefficient R = 0.936 that indicates a firm connection between signs *Expenditures of funds* and *Number of Visitors*. Determination coefficient *R Square* = 0.876 indicates how large scatter part of *Expenditures of funds* can be explained by its linear connection with *Number of Visitors* that in its turn indicates that 87.6% of the number of visitors of "Maija Park" can be explained with a linear regression model. The Null Hypothesis of Student criteria is

$H_0: \beta_1 = 0$ has been denied because Sig. = 0 (Figure 3)

Linear regression equation:

$$(1) \quad \hat{y}_i = 61.042 + 0.73X_i, \text{ where}$$

$\hat{y}_i$ - estimated numbers of visitors.
X_i - finance expenditures.

Conclusions and recommendations

1. The research of Heritage parks in studies of the World scientists within the context of visitor attachment influencing factor: financial expenditures used for maintenance and renewal of the park are not directly declared, but mediated through the establishment of carrying capacity and optimum of number of visitors.
2. The result of the research showed a firm linear correlation (r = 0.936) that indicates a necessity to invest more finances into improving environment of heritage parks in order to increase attendance of cultural events.

The hypothesis put forward that the growth in the number of visitors of Heritage parks is connected with the amount of expenditures used for the maintenance and renovation of a particular Heritage Park.

The author recommends improving efficiency by:

1) including usage possibilities in the strategic plan of VHTC;
2) popularising VMP, by expanding corresponding information about them in homepages of Cēsis TIC, VHTC and www.cesis.lv ;
3) intensively advertising upcoming events in HMP;
4) continuing to investigate connection between the number of attendants of an event and invested finances for improving environment of Heritage park Maija Park;

5) performing a study on the optimum number of attendants of events.

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Kopsavilkums

Kultūrvēsturisko parku apmeklējumus ietekmē daudzi faktori. Šī pētījuma mērķis ir noteikt sarīkojumu apmeklētāju skaita pieauguma atkarību no vēsturisko parku uzturēšanai un atjaunošanai izlietotiem līdzekļiem par pētījuma vietu izvēloties Vidzemes reģiona Cēsu pilsētas vēsturisko Maija parku. Autore analizē pasaules zinātnieku vēsturisko parku un citu parku līdzīgu problēmu pētījumus, kas saistītas ar apmeklētāju skaita saistību no vēsturisko parku faktoriālās pazīmes *Uzturēšanas un atjaunošanas finansiālie līdzekļi*, analizē Latvijas vēsturisko parku situāciju un problēmas Latvijā, Cēsīs un pētāmajā objektā – Maija parkā. Pētījuma rezultāts parādīja ciešu lineāru korelāciju (r = 0.936), kas norāda uz nepieciešamību vairāk ieguldīt finanšu līdzekļus vēsturisko parku vides uzlabošanai kultūras sarīkojumu apmeklējuma palielināšanai.

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